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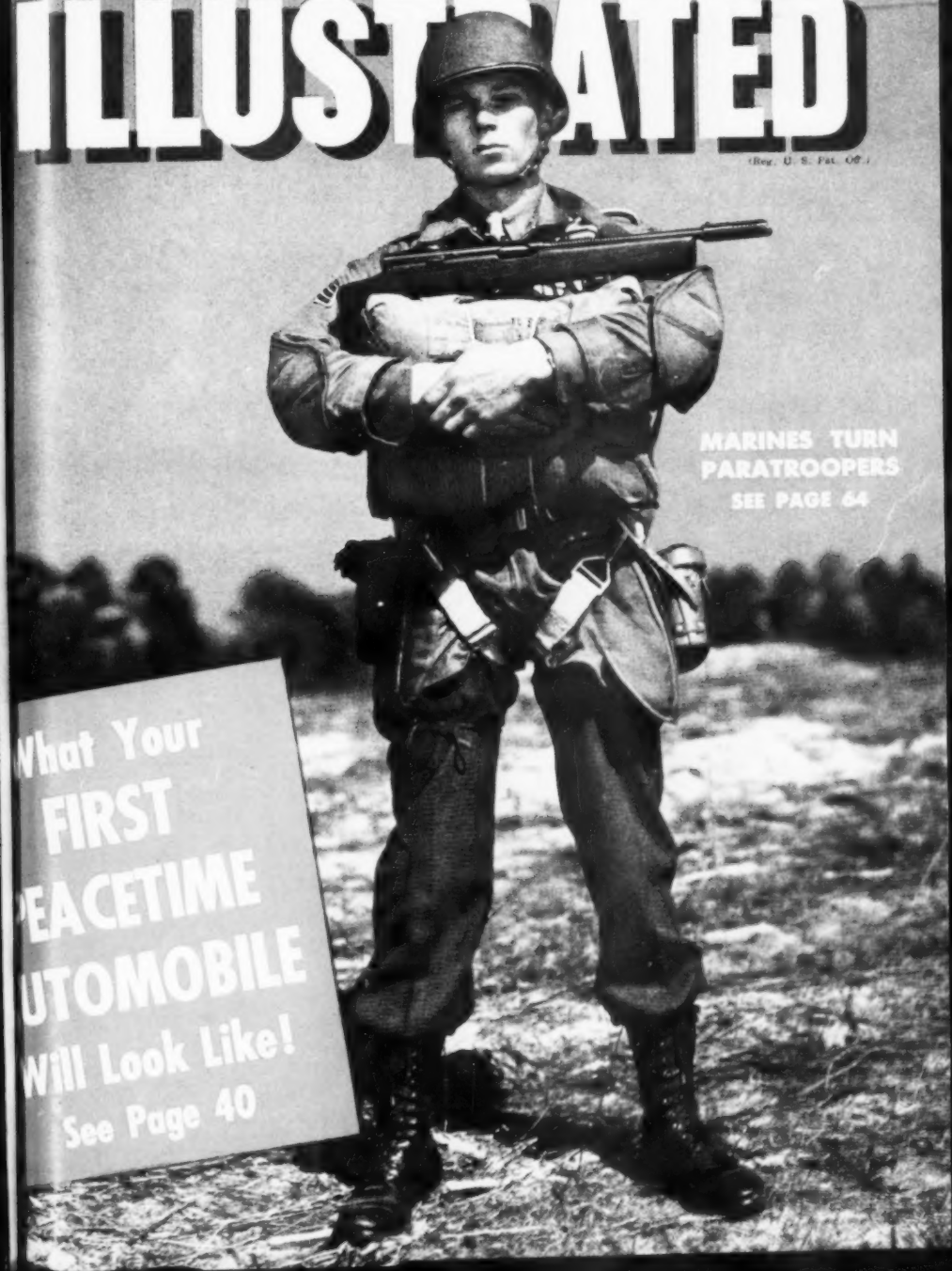

MARINES TURN PARATROOPERS
SEE PAGE 64

What Your FIRST PEACETIME AUTOMOBILE Will Look Like!
See Page 40

"I BUY ONE EVERY PAY-DAY!"

"I figure there are two good ways for a married man with kids to help his Uncle Sam right now.

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OCTOBER 1942

MECHANIX ILLUSTRATED

VOL. XXVIII NO. 6

W. H. FAWCETT, Jr., President

Editors: Roland Cueva Bill Williams

Associate Editors: George Daniels, *Aviation;* Norman C. Lipton, *Photography;* Charles D. Bonsted, *News;* Shirley Cutter, *Production*

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SPECIAL FEATURES

On the cover: Rudy Arnold took this natural-color photograph of Sgt. Roland Kachinsky at the U. S. Marines' Paratroop training base in eastern United States. More views of these tough, daring fighters on page 64.

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NEXT MONTH!

Of the startling developments which the war has brought forth, none can be more fantastic yet offer greater possibilities for practical effectiveness than rockets! For its November issue MECHANIX ILLUSTRATED asked Willy Ley to review rockets' success in war to date—in aiding overloaded German bombers take off, in special airplane rocket-bombs, in launching gliders, for example—and indicate their future in bringing victory to the United Nations. Perhaps the foremost rocket authority in America, Mr. Ley, one of the founders of the European Rocket Society and its secretary for years, states the case for rockets with impressive authority. Look for his eye-opening discussion in November MI!

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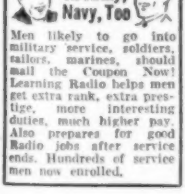
Find out How I Train You at Home for a Good Job in Radio

MAIL THE COUPON. I'll send you the FREE Lesson and my big, interesting book. They'll tell you about my Course, how I train you, what others have done, the types of jobs which are open to trained Radio Technicians. You'll read letters from more than 100 men I trained. You'll see what Radio offers YOU. And you'll have my FREE Lesson to keep. *Without obligation.* No salesman will call. Mail the Coupon NOW—Get started today on the road to bigger pay! **J. E. SMITH, President, National Radio Institute, Dept. 2KH, Washington, D. C.**

TRAINING MEN FOR VITAL RADIO JOBS



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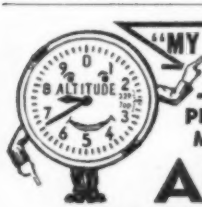

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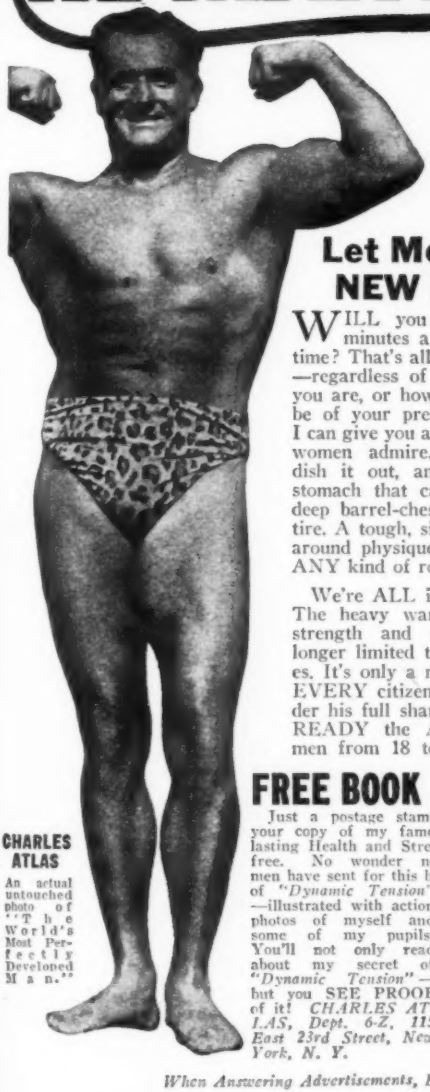
Pardon me for staring...

BUT JUST LOOK AT THAT

HE-MAN BODY



CHARLES ATLAS
An actual untouched photo of "The World's Most Perfectly Developed Man."

IMPOLITE or not—a girl just can't *help* staring at a man who's got a HE-MAN build! What about *you*?

Does YOUR physique KEEP 'em staring—or do you suspect that girls may be snickering behind your back? If you're built like a blacksmith around the chest and arms—if you've got a spring in your step and a sparkle in your eye that just radiate physical health and strength—*then* watch the panic among the girls! Which man would YOU rather be—HE-MAN or WEAKLING? Charles Atlas puts it UP TO YOU!

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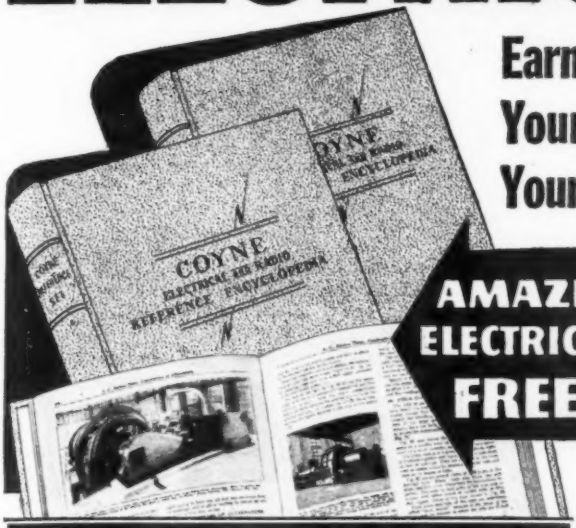

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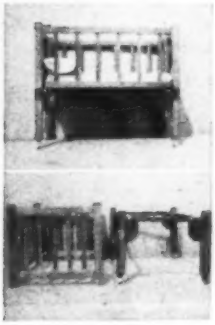
NEW PRODUCTS AND INVENTIONS

NEWS AND ADVICE FROM THE PATENT OFFICE REPORTED BY MORTON LEESE

PERHAPS you have wondered about the fate of patents and patent applications owned or controlled by enemy inventors and corporations. As in the last World War, an Alien Property Custodian has been appointed to assume charge of a large variety of property, including both patents and applications. Since the applications are still pending in the Patent Office, their prosecution will be assumed probably by attorneys appointed by the United States Government. As to the disposition of the patents after the war it is possible that many will be sold at public auction. After the last war, a large group of chemical patents were sold to the Chemical Foundation.

* * *



An ingenious father designed and patented this combination bed and play pen for a child's double use, and to save the extra cost the play pen usually means. End views of the item show the bed as used at night, and below, it is separated into pen and standard with springs. The patentee obtains the bed combination by offsetting the slide rods and telescoping two inches into the four bed posts at the spring level, somewhat as double bunks are separated into twin beds nowadays.

* * *

Inventors are often torn between making a decision to keep an invention secret instead of obtaining a patent. And once the decision is made it may be too late later to change it. Where an unpatented invention is kept secret and in time the secret is revealed, it may be impossible to obtain a patent, since public use of the invention for more than one year is sufficient to bar the grant of a patent. In a famous case, an inventor discovered a new method of making a particular glass. For ten years the invention was kept secret and the company made large profits. Then an employe disclosed the secret to a competing company. The inventor at that time sought to protect himself by applying for a patent. Although the patent was granted, it was later held invalid by the court on the ground that the inventor had failed to obtain his patent promptly. Most companies consider patent protection as highly important and avoid secret inventions.

* * *

To prevent a lawn mower from wandering away from its place of storage, a convenient hook that engages the mower roller has been introduced. The hook is screwed to a wall against which the mower is to be stored, in a position where the roller is easily inserted or removed. The device, by keeping the mower close to the wall, saves space, prevents barked shins, and reduces mower breakage.

Increasing employment of women in war industries has resulted in the introduction of light-weight, comfortable safety spectacles which can be worn with side shields for protection against flying metal bits, sparks, dust, etc., in factories. Part of their safety lies in the fact the lenses are made of a special material, not glass. The light weight enables workers to wear them all day without the fatigue of heavier goggles. Some plants require that visitors wear safety lenses as protection while in the plant.

* * *

In order not to use metals needed in war industry, this coffee dripolator is made entirely of china, even the perforated drip section. The holes, punched by means of a newly-devised process, are smaller than previously has been possible in crockery.

* * *

If you have obtained a patent in which a mistake has occurred through the fault of the Patent Office, it is possible to have the Commissioner of Patents issue a certificate of correction stating the fact and the nature of such mistake. The certificate will be recorded in the records of patents, and a printed copy of the certificate will be attached to each printed copy of the patent. Such mistakes

[*Continued on page 24*]

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Bear in mind that with the war-time curtailment of radio sets there is a huge increase in service work in homes. Radio manufacturing plants also need trained technicians to help produce over two billion dollars worth of military radio equipment. Factories are installing elaborate sound systems. Electronics is growing by leaps and bounds. Defense radio installations are without limit. All sound systems and innumerable defense hook-ups require **Trained men.** Prepare yourself for these job opportunities. **Enroll and Train** by National's easy-to-grasp home method.

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Douglas Nielsen, Jamaica, N. Y.

U. S. CIVIL SERVICE

"Am now employed by Civil Service as Junior Aircraft Radio-Electrician at McClelland Field. There are several other National Schools graduates employed by this Dept."
Milton H. Ross, No. Sacramento, Calif.

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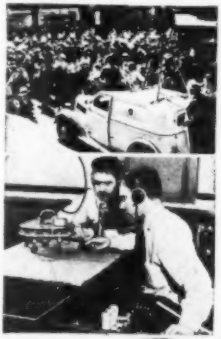
"Promoted to Instructor in Circuit Analysis at U. S. Army Air Corps here at Scott Field. Your Course has helped me very much and am sure it is responsible for my success."
Leland Gillum, Scott Field, Illinois



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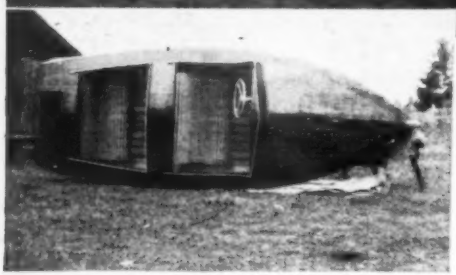


Frank Welland, of Spanaway, Wash., Rte. 1, Box 480, is the builder of this beautiful *Sportster* from plans in HOW TO BUILD 20 BOATS. He also built the *Mountain Lake Skiff* from boat book plans, together with a boat trailer. But all this boat work is just in the course of his hobby—he works in the Seattle, Tacoma Shipyards. Regarding his various boat building projects from MI plans he writes "Plans were easy to follow, and the performance of the finished products were beyond expectation." Well, this month's Workbench first award of $5.00 and a Certificate of Merit go to Mr. Welland for these photographs of his boat.

Your Home Of Tomorrow

IN THIS issue, MECHANIX ILLUSTRATED presents a "sneak preview" of your first peacetime automobile (see page 39), as the opening article in our new series, "A World You Never Knew." It's going to be a pretty startling car, we think you will agree. Please bear in mind that this car is designed from *actual plans and improvements* already accomplished as a result of wartime research.

But the revolution that's coming in automobile design is just a starter in the wonders that are coming if we succeed in whipping the Axis and bring about Peace. Almost everything you use in your daily life—machines, gadgets, refrigerators, household equipment, methods of transportation—is going to be radically changed as a result of lessons we are being forced to learn in our war effort.

One of the major revolutions, with the coming of peace, is going to be in housing. The building of private homes in America has almost come to a standstill at present because of shortages of essential materials.

Some twenty million of you Americans would build a new home today, if the war were to end, according to figures we have. When Peace comes, then, a great flood of home building is going to be released in this country. What are these new homes going to be like?

We can assure you, these new homes are not going to be anything in the world like ordinary houses you now live in. Just as in the case of automobile design, the war has thrown all the ideas about housing out the window. Rush problems of housing defense workers in new boom-town areas, of building Army camps, of emergency construction—all of these things have smashed the traditions of home building which ruled America for so many decades.

You can now, for instance, order a home at nine o'clock in the morning, have it erected on your own lot and move into it by nine o'clock in the evening of the same day! By another system your home is delivered to you on trucks in three or four sections and rolled together like a jig-saw puzzle, with all the plumbing and fixtures in place; with the interior completely decorated—even to curtains hanging on the windows!

But the revolution in house construction is only part of the story. Old ideas about lighting

and heating have gone out the window, too. And air conditioning has made tremendous strides.

In next month's MECHANIX ILLUSTRATED, Donald G. Cooley and the industrial designers, Martial & Scull will tell you about the wonderful new home you will have after the war—with added illustrations designed by Norman Bel Geddes and other famous designers and architects.

Don't miss the second in our "A World You Never Knew" series next month—"Your Coming Peacetime Home." In November MECHANIX ILLUSTRATED.

Your Inventions

ON PAGE 39 of this issue, we note the fact that at this very moment inventors have the greatest opportunity in history to cash in on their ideas. The old ideas are out. When the war ends, the whole of America is going to be "invented" all over again. And *right now* is the time for all inventors to patent their ideas, so they will be prepared to cash in on this "World You Never Knew" that's coming.

[*Continued on next page*]

INVITATION FROM AN ENGLISHMAN

John C. Priest, of Chapel Street, Blackpool, Lancashire, England, is the builder of this fine model of the "Mayflower." It took Mr. Priest 470 hours to build the model, but when it was completed it took the 3rd highest award in the All-England Model Engineer exhibition (1938). Lately, however, Mr. Priest has had more important work to do—first building tanks, and now aircraft. All his experience in working to fine limits on models serves him well today. He ends his letter to us by saying,

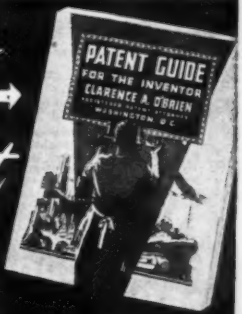
"Now if any American model men and homecraft readers of MI—find themselves in the vicinity of Blackpool while they are on war service—well we still have coffee and cookies and a warm welcome. Pass on the invitation please.

Very sincerely,
John C. Priest."

We're passing on the invitation as Mr. Priest has requested, and mailing him a $3.00 Workbench award and a Certificate of Merit.

INVENTORS

Get this FREE→ *Expert Advice* ON HOW TO PATENT *and* SELL YOUR INVENTION



ACT QUICK - DELAY CAN BE DANGEROUS

If you have an invention—if you feel that it is commercially valuable and want to protect your rights to profit from it—send for our Free "PATENT GUIDE FOR THE INVENTOR"—NOW! For a good practical invention, plus prompt action in securing a Patent and locating a buyer or a good market, have proved the secrets of success for thousands of inventors.

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Our "Patent Guide" answers many important questions concerning Patents. It tells what facts, details, drawings, sketches, etc., are necessary to apply for a Patent; how to establish proof of your invention through dated and witnessed disclosure. We also send you our FREE "Record of Invention" Form and show you how to USE IT AT ONCE, without cost, before you file Patent Application. Our Guide also shows you how Patent Office Records can be checked to determine whether an invention is probably patentable before filing fees need be paid; discusses costs involved and a practical way these can be paid in installments as the application progresses through our office. It tells how some inventors secured financial backing; how many simple inventions proved large commercial successes; how patents covering improvements can be profitably protected and marketed; tells countless other facts of vital interest to ALL inventors.

Remember—in Patent matters DELAY CAN BE COSTLY—ACTION IS IMPORTANT. Mail the Coupon NOW—in an envelope or pasted on a penny postcard to: CLARENCE A. O'BRIEN and HARVEY B. JACOBSON, Registered Patent Attorneys, 23-K Adams Building, Washington, D. C.

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Editor's Workbench Chips

In line with this trend, MECHANIX ILLUSTRATED has two important announcements to make this month:

1. Beginning next month, MI will present a brand new monthly feature, entitled, "Your Patent Clinic." It will be conducted by Joseph Kraus, who is perhaps the best trained man in America to give practical advice to inventors. For more than 20 years, Mr. Kraus has been giving practical advice to inventors on their ideas, through various technical and popular magazines which he has edited and by means of a well known radio program which he conducted. In a monthly column, Mr. Kraus will answer letters from inventors seeking advice and judgment on their ideas. There will be no charge for this service. Where it is possible, Mr. Kraus will also attempt to answer by letter those queries which cannot be answered in his column in MI. We must make the explicit condition, however, that Mr. Kraus will be able to answer only a limited number of letters.

The distinguished MECHANIX ILLUSTRATED Advisory Inventions Board (whose members are listed on page 4 of this issue), cooperating with Mr. Kraus, hope by this means to bring out worthwhile ideas both for war and peace, and wish to encourage American inventors to come forward with their ideas at this time.

If you have ideas for America, then, watch for Mr. Kraus' new feature starting in next month's MI, "Your Patent Clinic."

2. Our second announcement concerns an outstanding article scheduled for next month's MI. It is entitled, "The World's Ten Most Needed Inventions." It is written by another noted man in the field of inventions, Mr. Raymond F. Yates. For a quarter of a century, Mr. Yates has been in close contact with the leading inventors, researchers and industrialists and was an intimate friend of such men as Charles A. Edison, Lee De Forest, Charles Steinmetz, and many others. He

MR. DALE AND HIS DOG "SKIPPER"

Victor Charles Dale, of 276 Enfield Cresc., Norwood, Man., Canada, built the kayak shown above. The dog that looks so comfortable in the cockpit with Mr. Dale is "Skipper." The boat doesn't leak a drop, Victor tells, us, and that's a fine start for a 14-year-old boat builder. A $3.00 Workbench award and a Certificate of Merit go to Mr. Dale for this snapshot.

is himself an inventor of note and is vice-president of Krome-Alume, a corporation which has been highly successful in launching a revolutionary method of plating light metals.

Mr. Yates is the author of a forthcoming book, "2,100 Needed Inventions," to be published by Wilfred Funk, Inc., New York, on September 28. This book will contain the most comprehensive list of suggestions for inventors to work on that we have ever seen (we have seen advance proofs of it). Our article will be a condensation of portions of this unique forthcoming book. We believe everyone with a knack for original thinking will be greatly interested in it. Be sure to read it in November MI.

Second Front

AS THIS magazine goes to press, there is every indication that the United Nations are about to embark upon a second front in Europe or the Near East. Perhaps by the time you read this paragraph, some such action will have started. At any rate, it is plain that the war has entered a crucial stage.

In view of these circumstances, we think the article appearing on page 74 of this issue is particularly appropriate at this time. It is, "The Secret of Axis Strategy," by Major Malcolm Wheeler-Nicholson, MECHANIX ILLUSTRATED military expert. We believe it will open your eyes and give you a better conception of *how* this war is being fought, and the science of strategy behind it. It will enable you to understand better the

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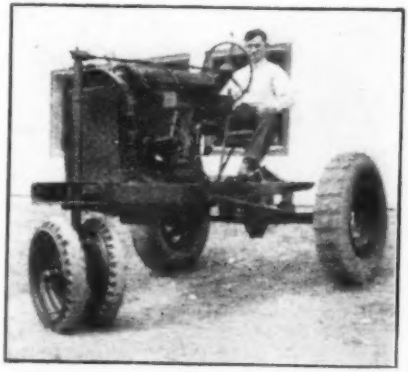

Joseph Szczech, of Whitehouse Sta., N. J., built this tractor for about $10. Most of the work was done right on the farm with materials found on the farm, except the welding. Front wheels are solid rubber (20x3") and the rear wheels (36x8"). The tractor will pull two 14" plows and do other heavy work. "If anyone wants more details," says Mr. Szczech, "I will be pleased to send them." This snapshot brings him a $3.00 Workbench award and a Certificate of Merit.

INVENTORS

READ THIS BULLETIN

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EVANS CURRENT REPORT

ALIEN PROPERTY RIGHTS NOT REVOKED BY U. S. GOVERNMENT

Since the principal publications throughout the country have been giving front page space to articles having to do with the seizure of alien property rights, patents, etc., many inquiries have been received by us regarding the advisability of proceeding with patent applications in the face of such seizures.

In the instance of the seizure of the patent rights of enemy aliens residing in their own countries, an evaluating agreement will be reached between the Alien's Government and the United States Government and the enemy patent holder may look to his Government for compensation. The resident aliens may appeal to a special claims committee set up in this country and after due proceeding had, compensation will be awarded on the basis of use and value of patent rights to the United States.

PATENT PLANNING COMMISSION ANNOUNCED (BUSINESS WEEK OF JANUARY 24, 1942)

The Patent Planning Commission is now being set up to create a reservoir of new inventions as well as improvements upon known devices, which will become the primary productive aim of the 30,000 war production plants to be converted for industrial manufacture during the post war period.

* * * * *

Far-sighted inventors should have their patent applications prepared now in preparation for a vast patent-buying era.

WHY DON'T THEY . .

(Reprinted from American Magazine)

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Editor's Workbench Chips

moves being made upon the great checkerboard of war.

Incidentally, Major Wheeler-Nicholson is the author of a new book being published this month, "Why Win the Hard Way?", which deals extensively with the strategy of invasion in Europe.

New Books

TWO new books have come across our desk this month about which we believe MI readers should know. The first is the new "Procedure Handbook of Arc Welding Design and Practice," published by the Lincoln Electric Company, Cleveland, Ohio ($1.50). Since the revolution in industry brought about by welding (see "Welding —This War's Revolution," MECHANIX ILLUSTRATED, July, 1942), there has been ever increasing interest in this subject. This book, called, "The Bible of the Arc Welding Industry," is an exhaustive "manual of arms" of the subject, which we can recommend highly.

You camera fans who have had trouble finding accessories and new equipment lately will welcome Ward's 1942 Camera Catalog, recently issued. A large assortment of cameras, projectors, films, and photo accessories are listed in this 36-page volume—at ceiling prices. They may all be had through the various Montgomery Ward Mail Order Houses throughout the United States. The Ward catalog places special stress on color photography. And, in addition to the equipment listed, it contains an editorial section dealing with helpful hints for making color pictures; information on choosing a camera, and essential data about lenses. You can get your free copy from the Montgomery Ward Photography Department, Chicago, Ill.

FIND THE MONKEY WRENCH

Ed Prins, of 622 Central Avenue, Holland, Mich., certainly did an unusual job when he turned out this tiny wrench. Filed by hand from brass, it is a complete model of a full sized wrench, and the amazing thing about it is that it actually works. It's only 2 9/16 inches long. A $3.00 Workbench award and a Certificate of Merit go to Mr. Prins for this snapshot.

Editor's Workbench Chips

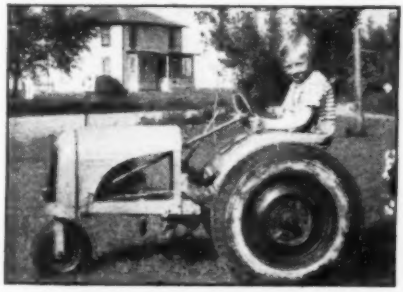
Music On Film

SCIENTIFIC developments of major importance were announced at the centennial anniversary celebration of Agfa Ansco, held in New York recently—Ansco Color and Ozaphane. Since the products themselves will not be available for consumer use until the war is over, we are confining our report to this section, for the time being.

Ansco Color is a direct, full-color photography process producing transparencies which the amateur or professional photographer can develop at home, with ordinary equipment. Unlike the color films which are now available and in common use, Ansco Color is being manufactured in a complete variety of cine, miniature, roll, and cut film sizes—for the use of the Nation's armed forces. Results shown at the celebration were of generally high quality.

Ozaphane is an inexpensive sound and music recording film which does away with many of the drawbacks of conventional phonograph discs, and of sound-recording systems that make use of photographic silver film. The Ozaphane playback strip consists of a diazo dye image imbedded in a thin cellophane base. It is printed from an original photographic film recording in a continuous daylight operation that proceeds at a rate of 80 feet a minute. The light-sensitive diazo compounds with which the undeveloped strip is impregnated develop when fumed with ammonia, and neither fixing, washing, nor drying are called for subsequently. Compared to phonographic discs, Ozaphane requires no changing of discs, needles or other interruption no matter how long the recording played; moreover, the material is not liable to wear, breakage, nor scratching which might impair the quality of the reproduction. Ozaphane costs about 1/10th as much as silver motion picture sound track material; hence

IT PULLS AN AUTO TRAILER



James Rathert, of Forman, N. D., built this baby tractor from junk parts. It's constructed to the general proportions of a Model R, Minneapolis Moline tractor, scaled down. James tells us that it has enough power to pull a 2-wheel auto trailer. Nice work. This snapshot brings Mr. Rathert a $3.00 Workbench award and a Certificate of Merit.

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Editor's Workbench Chips

it is practical for domestic use. In addition, where a 1,000-foot roll of silver film will play 18 minutes, an Ozaphane roll of equal diameter will play for 60 minutes. Recording and reproducing systems are in the process of being developed, toward the end that Ozaphane music will be introduced into the American home at the earliest possible time. Naturally, the demands of the war will delay production on a commercial basis.

Big Boom

WE'RE beginning to suspect that the Nazis are getting cabled reports on the contents of MI. A few months ago, we reported on Vincent Burnelli's design for a tank-carrying plane. About two weeks later, news dispatches reported such a plane was being used by the Nazis on the Russian front.

In our June issue, we ran an article by Willy Ley, war weapons expert, suggesting that America build heavy mine throwers to be used to break up tank attacks. Now comes an Associated Press dispatch from Moscow announcing that the Nazis are using exactly such mine throwers (230-millimeter, or 9.05 inch) on the Russian front, with dreadful results. (Mr. Ley, incidentally, is another of the long list of MI contributors who are having new books published. It is "Shells and Shooting.")

We don't know, of course, how many new weapons the U. S. Army and Navy have up their

TOO BAD IT CRASHED

Robert Artz, fourteen-year-old model builder, of 205 So. Kline St., Aberdeen, S. D., built this 1/5 h.p. 6-footer. It's a beautiful construction job but tough breaks cracked it up on its maiden flight. Bob's not the type to be easily discouraged, however, so he went to work and built another. That's the spirit, Bob! This snapshot brings young Mr. Artz a $3.00 Workbench award and a Certificate of Merit.

Editor's Workbench Chips

sleeves. But we do hope that America is being as receptive to new ideas as the Nazis apparently are. MECHANIX ILLUSTRATED knows of a number of highly practical sounding suggestions which its readers have made to Washington in the way of new and revolutionary weapons. We can only hope and pray that no military or naval brass hats are turning down these suggestions as they come in. MECHANIX ILLUSTRATED, however, intends to keep on harping and pounding on this subject until we are certain that Washington is heeding these new ideas.

Two New Annuals

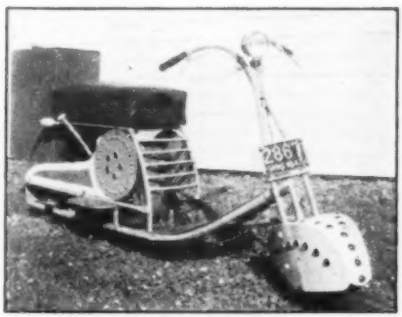
MODEL and Radio fans, as well as others who enjoy reading MI's cluster of annual satellites will be interested to know that they are shortly in for a treat. New issues of MODEL BUILDER'S MANUAL and RADIO MANUAL will soon be out, crammed with new projects and information covering these two hobby fields. We can't say anything more about them yet—except that they'll be as good as, or better, than last year's *MANUALS*. Watch for a detailed announcement shortly!

One-Man Production Line

MI readers have long been familiar with the name of Walter E. Burton, through his many contributions to the magazine's pages. He is responsible for two fine How-To-Build's in this issue—"Welder's Table," on page 108 and "Portable Amplifier" on page 114. These articles, in some measure, show Walter's great versatility, and it would be hard to name a subject that he has not covered, and efficiently, in his writings.

Mr. Burton is 38, unmarried, likes traveling and

CAN MAKE ANY HILL



Robert Thomas, of Birchwood, Wis., built this sparklingly ornamented motor scooter which boasts an 8 to 1 low speed ratio. In high it's 3½ to 1. The combination gives the 1½ horsepower scooter a speed of 35 in high and the ability to take practically any hill in low, according to its builder—who gets a $3.00 Workbench award and a Certificate of Merit.

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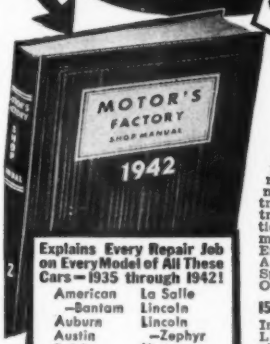

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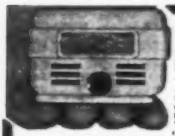

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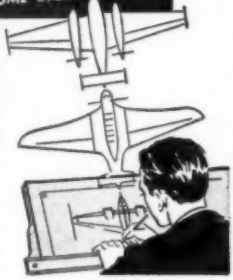

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making gadgets. He has a generous imagination, an offhand working knowledge of many things mechanical and scientific, and a way of expressing himself that the average reader can really chew on and digest. But let's let him tell about himself in his own words:

"Back in 1919 or thereabouts, when I was in high school, I was presented with a half-interest in a rowboat for which there were no oars. The owner of the other half was Earl Shugars, who is now Associated Press cameraman in Miami, Florida, and vicinity. We decided to turn the tub into a sailboat, and labored long hours making a mast, sail, and a tricky rudder that would swing up over submerged logs and sand bars without ripping the stern out of the craft. Since we also were interested in photography, we shot some pictures of the rudder. Fortunately, no doubt, somebody stole the boat before we had made more than one trial run, a run in which the boat showed some of the traits of a submarine. But the venture wasn't a total loss, for I heard that magazines pay genuine money for the stuff they print, sent a picture and description of the boat rudder to one of them, and got for my daring a five-buck check that kept my mind off Algebra and English Lit. for days.

"That was the start of my magazine contributing; and the boat pictures no doubt had some influence on Shugars' later camera work. I finished high school at Kenmore (now part of Akron) Ohio, attended night classes at the Uni-

HE DIDN'T TAKE $10 FOR IT

Jimmie Kaiser, of Beatrice, Neb., posed for this time exposure of himself and his 27" model of Columbus' "Santa Maria." Jimmie's eight years of model building experience enabled him to turn out this one in a single week, and when he had a chance to get $10 for it he turned it down. That's the way it is with many dyed-in-the-wool model builders. Now he gets a $3.00 Workbench award and a Certificate of Merit—and he can keep the model too.

versity of Akron while doing reportorial work on the now extinct *Akron Evening Times*, and later shifted to Baltimore to attend Johns Hopkins University. After doing more time on newspapers as reporter, feature writer, photographer, and sundry other things, I took the plunge into fulltime freelance writing in 1926, and have been at it more or less steadily ever since.

"I have written more articles than I can recall, and have covered such fields as photography, microscopy, aviation, house building, hunting, fishing, dog training, circus activities, and underground rivers. I have leaned toward mechanical and scientific subjects, although I once disposed of some whodunit short stories. I have written a half-dozen books, five of which were published anonymously. The sixth will appear this fall."

Bikes Again!

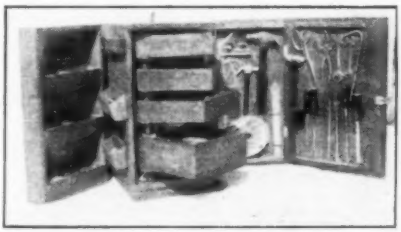
THOUGH we should have expected it, because of the gas and tire situation, we weren't quite prepared for the tremendous response to the article on motorizing a bicycle which appeared in the July issue of MI. Apparently hundreds of people were just sitting around twiddling their handlebars waiting for someone to come along and tell them how to put an engine in the old wheel. The ink had hardly dried on the pages before letters and photographs of conversions started pouring in, and at this writing they're still coming, thick and fast!

Thank you, gentle readers; we're gratified that you liked the idea so much and *did* something about it—and if you'll turn to page 26 you'll see what we've done, in turn. Sorry we didn't have the space to use all your pictures, but we picked out a typical group. Hope you like 'em.

Pin Money

UNLESS you're a soldier, sailor, flyer, marine or other member of Uncle Sam's armed forces you needn't bother reading this, because you can't qualify for what it requests.

IT HOLDS ALMOST EVERYTHING



Floyd J. Stacy, of Alpena, Mich., built this handy tool box from wood obtained from old orange crates. Its many compartments and drawers hold practically every tool needed in the workshop. Mr. Stacy tells us. A $3.00 Workbench award and a Certificate of Merit go to Mr. Stacy for this clever job.

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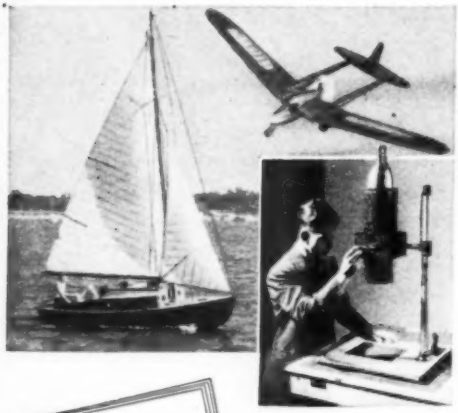

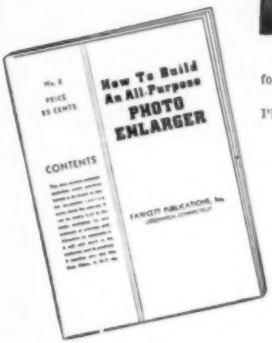

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Editor's Workbench Chips

However, if you're wearing a uniform, you've probably noticed our new "department," *Ideas for Service Men*, which has been running for the past several months. Judging from the mail a lot of you have not only noticed it, but have read it with enjoyment and followed some of its kinks and suggestions.

Now, maybe in the course of your daily life in the Army, Navy or Marines you have come upon little ideas and "shortcuts"—easier ways of doing this or that, or making this or that—which would be of value to other service men if they only knew about them. You may already have stumbled across such kinks, or thought them up to fit some occasion or purpose—then forgotten about them; perhaps, if you're the careful type, filed them away mentally for future reference.

To make a long story short, why not dig around in your memory book, or keep an eye open from now on and send us in any ideas you think might be helpful to your buddies? We'll pay you good, hard dough for them (we assume you could use it)—from three bucks up per, depending on the amount of space they require, and your pals in your own and other camps will benefit thereby. Get out paper and pencil and *go to it!*

Tree growers advocate planting trees in irregular groups along highways to lessen glare—uniformly spaced trees are monotonous, and might induce driver drowsiness.

Traditional luck of the farmer's wife with house plants in the kitchen is largely due, says a botanist, to the vapor pouring steadily from the kettle on the range into a moderately heated room—very different from hot, dry air of many city dwellings.

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Henry B. Worthey, of Eldon, Missouri, R.F.D. 1, Box 16, built this rugged little Briggs & Stratton powered tractor, using scrap materials for its construction. He tells us that it can pull a 5" plow 5" deep in any soil. It brings him a $3.00 Workbench award and a Certificate of Merit.

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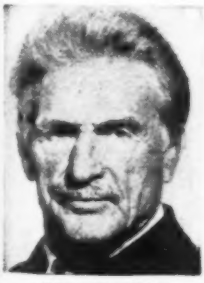

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New Products And Inventions

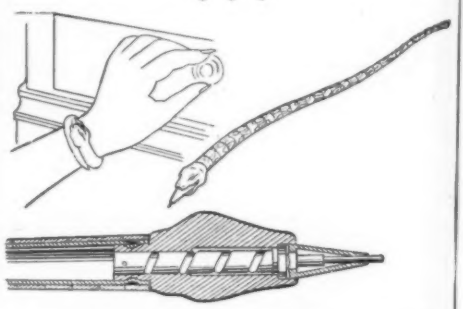
[*Continued from page* 10]

can occur during the printing of the patent or as a result of clerical oversight in the Patent Office. The certificate of correction can be obtained either by the original patentee or the person to whom the patent may have been assigned.

* * *

A patent may be infringed by making, selling, or using the invention. Of course a combination of two or all three acts would also constitute infringement. Moreover, a person is an infringer whether he acts innocently or deliberately. There is the difference, however, that a deliberate infringer may leave himself liable to greater damages than an innocent infringer. Whereas an innocent infringer is liable only for the actual damage to the patent owner plus any earned profits, the deliberate infringer is liable for three times as much damages.

* * *



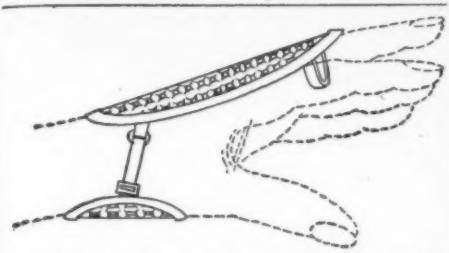
An ornamental bracelet that also serves as a pencil won a patent for Henry Wallace of Freeport, N. Y. Recognizing that the majority of pockets in ladies' wearing apparel were not designed to carry pencils, this inventor devised a bracelet so constructed that it will form the body of a pencil when the pencil is in use. The bracelet is in the form of a serpent, and the lead and cap portion of the pencil projects from the open mouth of the serpent head to give the illusion of a serpent's tongue. The metal for the body member is sufficiently ductile to allow it to be straightened, and it is also sufficiently inflexible to permit an effective use of it as a body of the pencil. (No. 2,266,942.)

* * *

To permit a motorist to make a visible hand signal at night, Wiley Williams of Spokane, Washington, has invented a device having reflecting surfaces both front and rear, and adapted to be worn by a driver without disturbing or interfering with the ordinary use of the hand for manipulating the car.

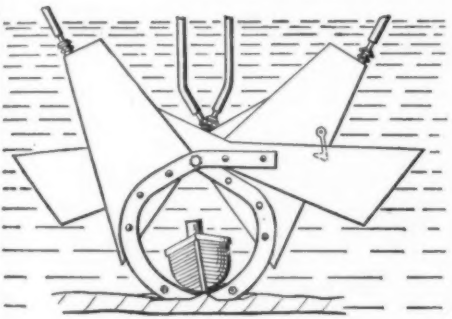
The front and rear reflecting pads are joined by adjustable elastic strips, which enable the signal to be worn by any size hand. On the forward end of

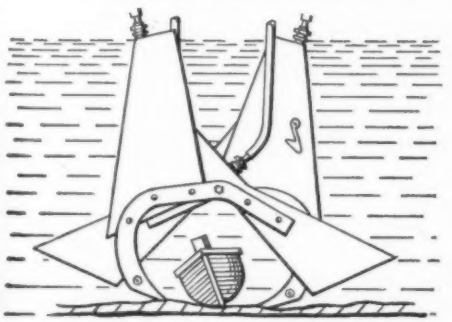
New Products And Inventions



the outer pad there is a finger loop which assists in securing the pad to the hand. The use of two pads permits drivers coming up from the rear to see the signal; while cars in front will see the opposite pad in time to avoid collisions. (No. 2,279,029.)

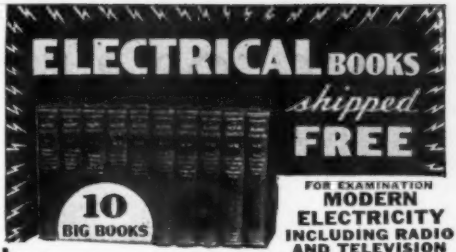
* * *





Raising sunken vessels, such as submarines, may be done by means of float-operated jaws, according to a recent patent granted to William Scofield of Old Greenwich, Conn. Huge floats fastened to pivoted jaws control not only the movement of the jaws, but also serve to raise and lower the jaws to the submerged vessel. By means of air inlets and outlets in each float it is possible to allow either air or water into the floats. In the operation of the device, the unit is towed by a suitable ship to a position over the sunken vessel.

[*Continued on page* 33]



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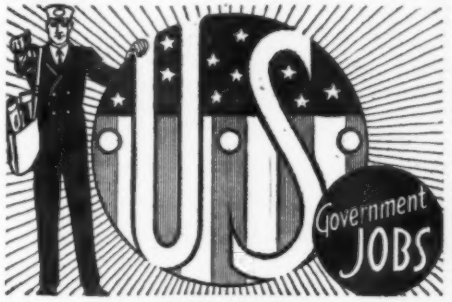

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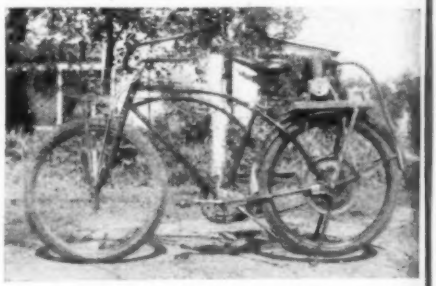
M-I READERS BUILD MOTOR BIKES

IN THE July issue of MECHANIX ILLUSTRATED an article under the title "Motorize Your Bike" contained plans and instructions for putting power in the old two-wheeler. Here are a few photographs of motorized bikes turned out by MI readers to save tires and gas. Those who missed the article in MI will find it in HOW TO BUILD IT No. 9, now available.

Right: LaVerne Richardson, of Kelley, Iowa gets 120 miles to a gallon, and 25-30 miles an hour with his job from MI plans. A Certificate of Merit and $3.00 go to Mr. Richardson for this snapshot of his bike.

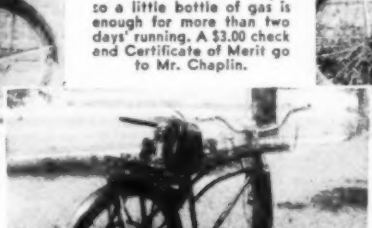
Left: Gordon Fendick, of Zion, Ill., Route 1, Box 95, is the builder of this one. His drive set-up gives a top speed of 20, but plenty of pickup. He gets $3.00 and a Certificate of Merit.

Above: Charles Lambert, of Mulkeytown, Ill., RR No. 1, built this one. Motor is mounted motorcycle fashion. Total cost, motor and all, $6.35. Certificate of Merit and $3.00 are on the way to him.



Above: Steve Marko, Carlinville, Ill., built this one at a cost of about $12. He gets around 20 miles an hour with ½ hp. A Certificate of Merit and a $3.00 check go to Mr. Marko.

Below: Gearld Chaplin, of Windsor, Wisc., built this one from MI plans, to save tires. He gets 46 miles to a *quart*, and 33 miles an hour. He drives 20 miles a day—so a little bottle of gas is enough for more than two days' running. A $3.00 check and Certificate of Merit go to Mr. Chaplin.



Above: Carl Scherz, of San Angelo, Tex., Box 856, sent us this picture of the bike turned out by his friend, Mr. L. G. Gray. It does 30 miles an hour, gets 125 miles to the gallon, and has run 3,000 miles already. Mr. Gray also eliminated a number of welds in building it. A Certificate of Merit and $3.00 go to the sender, Mr. Carl Scherz.

Above: Herman Swenson, of Sturgeon Lake, Minn., Route 2, Box 138, built this one that does 25 miles an hour. He also added a seat forward for another passenger. Herman is 18 years old, and quite evidently a very able mechanic. This snapshot of his motor bike brings him $3.00 and a Certificate of Merit.

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BOAT: *Ella Mae*, shown below, is a 17 ft. outboard cruiser that's easy to build and needs no fancy lumber—just plain, cheap wood will do. She has a sleeping cabin for two, is V-bottomed, and will push along at a good clip with a 3 H.P. outboard motor (no gas ration card needed). *Blueprint No. 968, Price $2.00.*

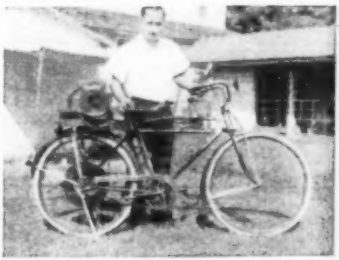
MODEL: Build an accurate scale model of one of the U. S. Navy's "T" Class submarines, pictured below. Plans include full-sized templates for hull. *Blueprint No. 336, Price $1.50.*

BOAT: Above you see *Flying Fisherman* living up to her name. Just under 12 ft. long, of plywood construction, she'll take any outboard from 1 to 20 H.P. *No. 967, $1.50.*

MODEL, right: Speed king of the model airways, *Yellow Jacket*, guide-line gas powered model monoplane. *Blueprint No. 329, $1.50.*

MODEL, below: Here's an action model that will give any boat model fan the thrill of a lifetime. You guessed it—a 26-in. model PT motor torpedo boat like the one Lt. Bulkeley smashed the Japs with. Completely detailed and powered with a midget gas engine. *Blueprint No. 330, Price $2.50.*

MOTOR BIKE, right: The answer to rubber and gas rationing. If you own a bicycle you can install a small motor that will push you comfortably along on practically no gas! Plans show two types of installation, and include a bike sidecar. *Blueprint No. H-82, Price $1.00.*



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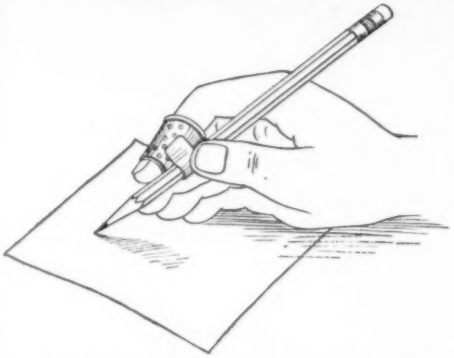
New Products And Inventions

[*Continued from page 25*]



Fatigue caused by extensive writing is greatly diminished by a new type of holder invented by Harry Johnson of Boston, Mass. The device includes a sleeve for holding the forefinger. A clip below the sleeve carries the pencil or pen. The writer may interrupt his writing with the pencil always available and at the same time he will have use and freedom of the hands without laying down and picking up the pen. Writer's cramp is reduced to a minimum since there is no great pressure of the fingers on the pencil. (No. 2,273,044.)

* * *

A boat that can be worn by fishermen is the contribution of Joe Meyers of Weleetka, Oklahoma. The garment includes leg and body members and a doughnut shaped buoyant unit which encircles the waist to support the wearer afloat. Propelling fins are attached to the outer sides of the leg portions of the garment so that the wearer can propel himself while in an upright position through deep water by back and forth motions of the legs. (No. 2,276,082.)

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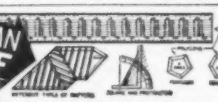

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Get The Job You *WANT* In The Army

If you want to be an Army photographer like these signal corpsmen, take your best prints, proof of awards, etc., to interview.

What you say and prove to the Classification Officer is vital to your army future. Here's what to do. . . .

by Harold S. Kahm

TWO days after Private Smith had arrived at the Army Reception Center as a brand new and slightly bewildered draftee, he found himself waiting in line for his Classification Interview.

It was an important moment. On the outcome of that interview would depend the answer to Smith's desire—to be an Army photographer. Photography was his hobby, and it was no secret that the Army was greatly interested in giving men jobs that would correspond, so far as possible, to their personal, special interests and abilities.

"You'll be a cinch," Smith's new buddies had told him.

Smith jumped up smartly when he heard his name called, and entered the small, private office where his fate would be determined. Fate? Well, there's a big difference in the Army as in civilian life between doing a job you like and one you don't like.

After the preliminary routine questions the Classification Officer, a trained personnel man, came to the vital subject of hobbies. "Photography," said Smith, "that's my dish. I bet I've got a hundred pictures just of my girl friend." He grinned.

Private Smith didn't know it, but he was the sixth man that morning who had told the Classification Officer that his hobby was photography.

At last the interview was over. Private Smith doesn't know it—soldiers are not told how they have been classified—but he is not

going to be an Army Photographer, so far as his official classification goes. Smith had not sold himself or his hobby. He had made the common mistake of assuming that the mere mention of his hobby would insure him the job he wanted.

One of the other newly-inducted soldiers waiting to be interviewed was Private Jones. Jones, too, wanted to be an Army Photographer. And that's what he is, today.

Why did Smith fail and Jones succeed?

Here's what happened when Jones came in for his Interview:

"My hobby," said Jones, "is photography. I guess I'd rather take pictures than eat. It's my ambition to become a photographer in the Air Force."

"Ho hum," thought the Interviewer, "another boy who's been snapping pictures of his girl friend and thinks that qualifies him to be a photographer." But that mental yawn was of short duration.

"You see, sir," continued Private Jones, "I've been devoting all my spare time to photographic work for the last six years. I do my own developing, printing, and enlarging. I've won

GLIDING

Top: A student officer gets final instructions on the controls of a glider before his first solo at 29 Palms, Calif. *Above:* Brazil aviation students take turns in the "think trainer," Uvalde, Texas.

ART

If your civilian vocation is in the fine arts, the Army may use your talent painting murals for post social centers like these soldier artists at the Ft. Belvoir studio, or in camouflage experiments.

SKIING

Good at skiing, mountaineering, self-reliance in the wilds? Parachute ski battalions may be just your dish.

RADIO Radio "hams" are in demand by the Signal Corps. Here's a private at the key of a portable W2SC in the rear of an Army panel truck.

two prizes for color photography, and one for motion picture work."

The Interviewer was instantly alert. This looked promising! The Army needed good photographers.

Private Jones opened a large portfolio he had brought with him. "Here are some samples of my work, sir, if you care to see them. These are my prize pictures, and the certificates. Here are some pictures I developed and enlarged myself—I took this one from the top of a mountain—it was as close as I could come to aerial photography. And here's a picture of my equipment. I made this enlarger myself."

For the next half hour Private Jones and the Classification Officer talked photography. Jones had his sample pictures spread out all over the office—most of them sharp, glossy prints, covering a wide variety of subjects and treatment. There was no longer the least doubt in the officer's mind that when it came to photography, this soldier knew his business.

A week after he had finished his basic training, which every soldier must take regardless of the kind of job he may be slated for, Private Jones, to his joy, was ordered to

DRAFTING This mechanized war requires a multitude of draftsmen for non combat but important duty. If you're qualified, say so.

report to the Air Force Photography School, preliminary to his becoming an Army Photographer—the exact Army job he wanted. That all-important Classification listing had done the trick.

Why had Private Smith failed? Actually, Smith was just as qualified to be a photographer as Jones. But unlike Jones, Smith had not come to the all-important Classification Interview prepared to sell himself. He thought it was enough to say that photography was his hobby. He didn't tell the important details and facts about his experience, the kind of work he had done, what he had accomplished. A Classification Officer is neither a mind-reader nor a cross-examining lawyer.

All photos by U. S. Army Signal Corps

SIGNAL PIGEONS Raising and training pigeons as a civilian hobby may result in your being given the same work officially. Radio hasn't outmoded pigeons in communications, by any means.

The Army is keenly interested in your hobby, and your job in the Army—the job you may prefer above all others—may be based on this hobby, whether it is photography, or horseback riding, or any one of dozens of others. But to get the job you want you've got to sell yourself, and do a mighty good job of it! You've got to make a good impression, all-around. The Army wants the best, and only the best for its special, important jobs.

Every newly-inducted soldier is given this highly important Classification Interview to determine the job for which he seems best-fitted. But, and this is highly significant, *not one man in a hundred comes to this vital interview prepared to present his case properly.* That's what happened to Private Smith. It could happen to you!

Not only is it necessary to "sell yourself" but you must come prepared to answer the Interviewer's routine questions, along with those of the written Classification Form, with promptness and intelligence. Here again a heavy proportion of men come unprepared and consequently fail to make a good impression. [*Continued on page* 156]

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A World You Never Knew

ALICE in Wonderland never saw a stranger world than the one you are going to step into the moment that peace comes.

Consider: Before this war, automobile companies put out a new model each year. Each new model was about 90 per cent "hangover" from the previous year's model. The reason for this was simple: Manufacturers had a big investment tied up in their tools and dies. They used them year after year.

But now the automobile industry has been completely converted to war production. *Now all the old dies and tools have either been junked or become obsolete.* All the old traditional ideas about automobiles have been tossed out the window with the old dies and tools.

Another factor: This war is forcing our research workers to produce tremendous new improvements in mechanics and science! These wonderful wartime discoveries are going to go into your new automobile, too.

Now, one more factor: With tradition tossed out the window and with old-line automobile manufacturers faced with competition from the aviation industry after the war, *the gate has been opened for all manner of new ideas.* If you are an inventor with a new idea for an improvement upon automobiles, you know that you had tough going in getting your idea considered before the war. But now your new idea—every idea available—is going to be eagerly sought after! The reason is simple: The gates are wide open and competition again is going to be fierce. (Incidentally, if you are an inventor, for Heaven's sake get a patent on your idea *right now,* so that you can cash in on the post-war bonanza.)

Put those factors all together, and what do you have? There is only one conclusion: When peace comes and automobile manufacturers go back to their regular business, they are going to turn out new models that will fairly make your eyes pop out of your head.

But that's only the beginning!

The automobile industry isn't the only one. *As a matter of fact, almost every other industry in America faces the same situation!*

For instance, we know that the new refrigerators, when peace comes, are going to be wonderful things. The new radios are going to be even more wonderful. The house you live in will be even more marvelous than the new radios. The food you eat, the clothes you wear, almost everything that touches your daily life—will all be *brand new!*

MECHANIX ILLUSTRATED has made an exhaustive survey, sent out thousands of questionnaires to business and science leaders all over America. We have retained Martial & Scull, noted New York industrial designers, and Donald G. Cooley, leading science writer, to digest this material and add their own research to it.

These eminently qualified men are going to give you a preview of the strange new world which peace will bring to us—A World You Never Knew—in a series of articles starting in this issue and continuing for 10 months. They will cover Automobiles, Your New Home, Your New Household Machinery, Your New Transportation, and half a dozen other fascinating subjects.

BUT REMEMBER THIS: *This wonderful new world will never be yours until we defeat the Axis.* And if you buy U. S. War Bonds now, when peace comes you will have the money to buy these marvelous new things that are coming with Victory.

For the first of the MECHANIX ILLUSTRATED articles in this series.

TURN THE PAGE

CONTINUED FROM PAGE 39

YOUR FIRST PEACETIME

Here is a "sneak preview" of the wonders the automotive industry is preparing for tomorrow.

by Donald G. Cooley

Designs By Martial & Scull

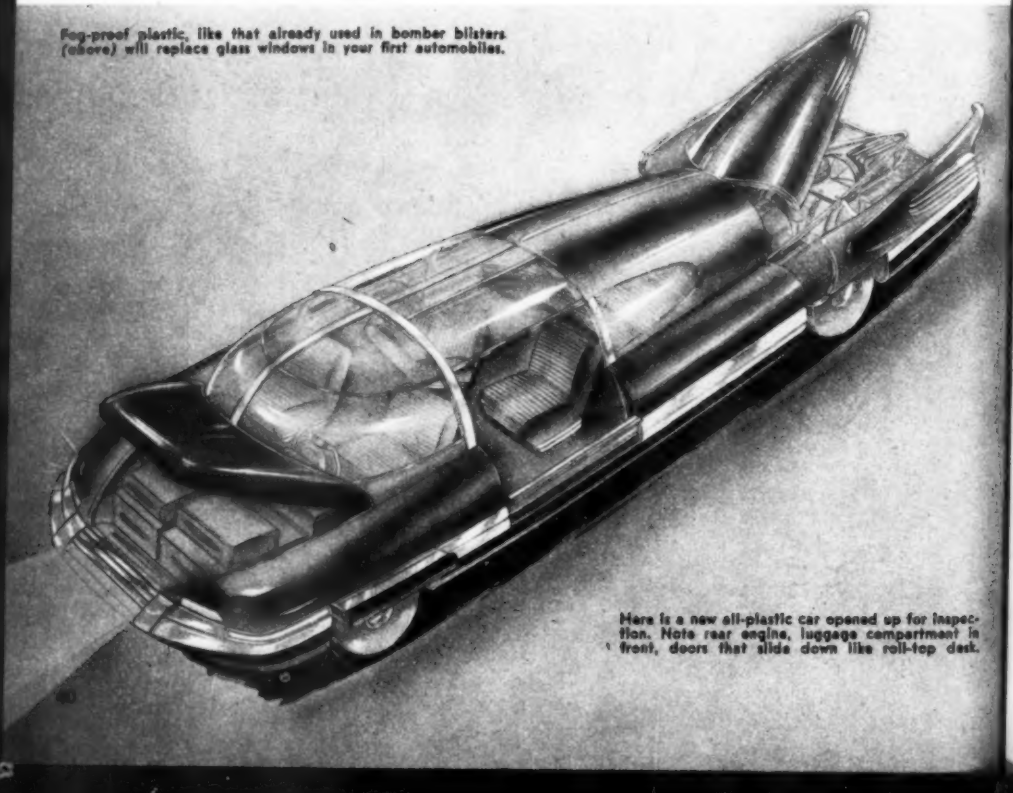
BOMBARDIERS in Flying Fortresses are protected by blisters made of transparent plastics—and you'll look out through the same kind of plastics when you sit at the wheel of the car you'll drive after the war.

Tanks tilt and tip crazily across rough terrain as they roar into battle—and your future car will have riding qualities learned from tank mechanisms to smooth out the roughest road.

A mosquito-boat streaks like a rocket under the tornado of power kicked up by its engines —and your car will have the same kind of bucking-bronco energy from motors smaller and lighter than anything you've dreamed of.

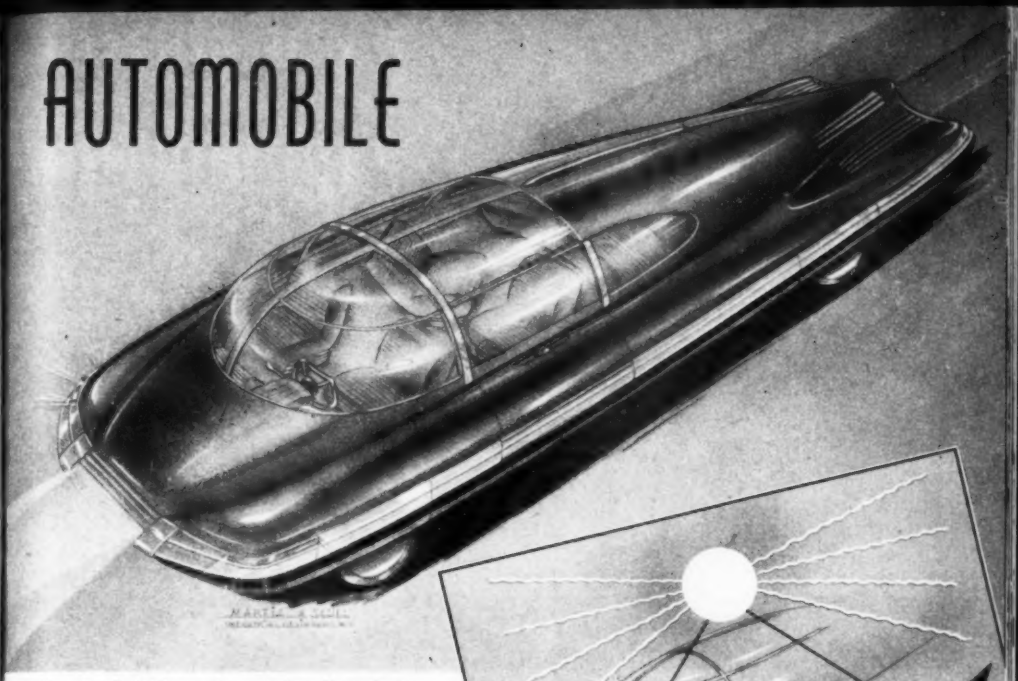
An interceptor pilot screams down upon a

Fog-proof plastic, like that already used in bomber blisters (above) will replace glass windows in your first automobiles.

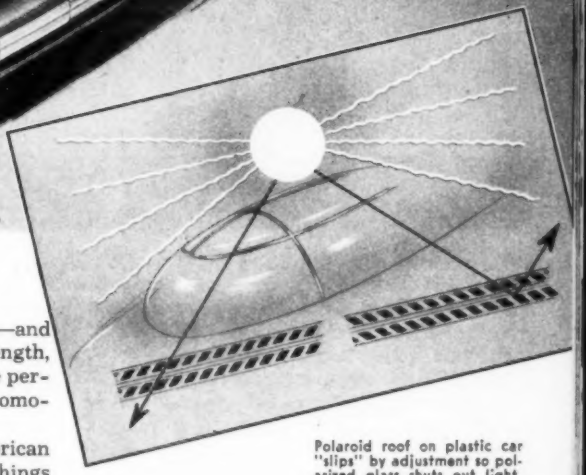


Here is a new all-plastic car opened up for inspection. Note rear engine, luggage compartment in front, doors that slide down like roll-top desk.

AUTOMOBILE



Here is all-plastic car in operation. Note single-beam headlight, lucite side-lights, all-around bumper. Plastic roof can shut out light *(see right)*.



Polaroid roof on plastic car "slips" by adjustment so polarized glass shuts out light.

bomber, riding on fragile-looking wings—and your car will have fighter-plane strength, thanks to light metal alloys that will save perhaps half a ton of weight in a single automobile.

Jeeps, tanks, planes and other American tools of victory are teaching engineers things they wouldn't have learned in a dozen years of peacetime research. All this new knowledge is shaking industry to its very foundations. upsetting old ideas of doing things, shaping the inevitable day after the war when motormakers will race to give the car-hungry public a product it never knew before.

And, more important, since the automobile industry has been converted to war production, it has scrapped all its old dies and tools. So, when Peace comes, they will start from scratch with hundreds of new and amazing ideas.

Already the ideas of engineers on tomorrow's motor cars are crystallizing, though they are far from frozen. From hundreds of different sources—corporations, engineers, inventors, research laboratories—MECHANIX ILLUSTRATED has collected those ideas, studied trends, and built a composite picture of tomorrow's car. Martial & Scull, noted New York industrial designers, have designed two new automobiles incorporating many wartime improvements, which are presented herewith (on pages 40, 41 and 43) to give you a "preview" of your first peacetime car.

It's *your* car, or will be when peace comes. You may be a little startled when you stand before it and study its sleek, unfamiliar lines. First you notice its shape, not unlike an elongated egg, blunt in front and tapering to the rear. The hood is shorter than you expect, rounding into a pleasing streamlined nose in which the fenders are included. There is simple ornamentation but no elaborate die-cast grillwork, and the bumper is a wide strip of white metal that runs entirely around the front and perhaps continues to the rear.

The sloping windshield, curving around the driver, sweeps back gracefully and the roof appears to be of glass, for the forward half of it is transparent. All you can see of the rear wheels is the lower circumference of the tires,

Swivel easy chairs with let down arms feature new car's interior. New generators make air conditioning possible. Food and drink refrigerator, for baby's milk, is fitted in air-conditioning unit in front.

for the body encloses all working parts in a smooth streamlined shell. Even the bottom of the car is a continuation of the body, flat and smooth, with drive shaft, girders, oil pan, and differential protected from dust and dirt.

The driver's compartment is strikingly like the nose of a bombing plane, made of transparent stuff supported by narrow tubular members. You notice that there are no projecting door handles—merely flush metal buttons which control the latch.

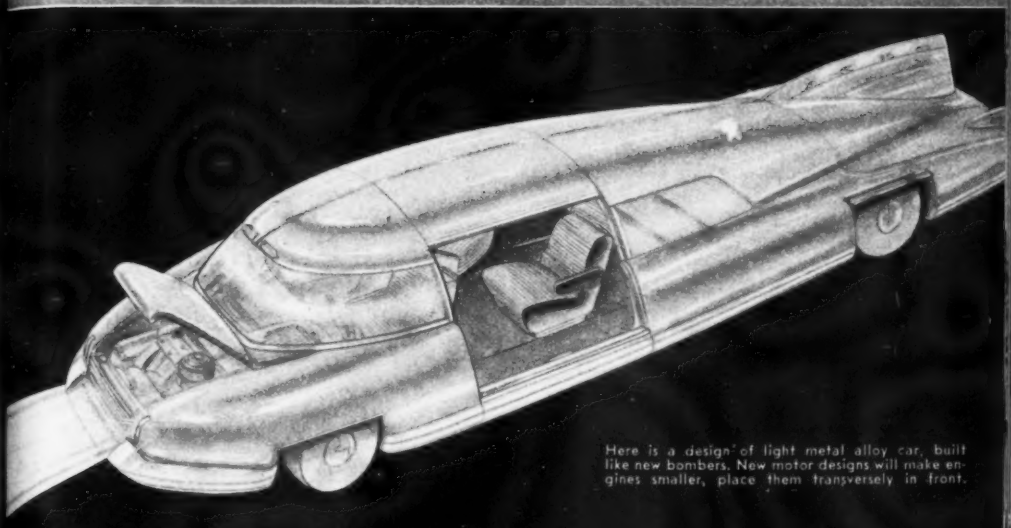
As you step forward for closer study you put your hand on the body. It feels queer. What is the stuff? When you tap it, it doesn't ring like metal but seems to be sound-absorbent. It is not painted; its color seems to run right through it. You learn quickly that it's a plastic body—grown on a hundred different farms, perhaps, compounded of resins, soy beans, cotton, wheat, straw, pine chips, or dozens of other ingredients. It dawns upon you that what you thought were glass windows are plastics too, of a different family, clear as crystal.

The interior holds further surprises. The side walls are smooth and clear, without window cranks or door levers. The floor is flat, without bumps—and where did all the room come from? It is as large as a good sized room and the impression is heightened by the fact that the "furniture" is arranged in living room style. You can have the chairs arranged in any way you wish, for only the driver's seat is fixed. Perhaps you would like a love-seat in the rear quarter, or swinging chairs like those in parlor cars, or—in some families—a seat for the backseat driver facing permanently to the rear.

Colorful upholstery on the seats appears different from what you are accustomed to. It is. The fabric is an artificial "wool" made from soy beans or cottage cheese, or a synthetic fiber impregnated with resins, or a cloth spun from glass, either of which can be cleaned quickly of dust and stains by wiping with a damp rag.

You slip under the wheel and are amazed to see that the road ahead is visible almost to the instant it is swept up under the front wheels. There is no clutch pedal. The plastic windshield curves around you as it does in a bomber, and the corner post is so narrow that there is no dangerous blind spot. Through the transparent roof above you it is easy to see suspended traffic signals, but you want privacy so you turn a control and a polarizing device, or an integral curtain, makes the roof opaque.

The half-width instrument panel in front of you fascinates you with its gadgets. The speedometer, ammeter and gas gauge are familiar enough, but other controls are strange. One of them says "Air Conditioner" and you learn that this unit is located under the hood in front of you, instead of the engine, and that



Here is a design of light metal alloy car, built like new bombers. New motor designs will make engines smaller, place them transversely in front.

the spare tire, tools and other units are stored there, too. Now it is plain why there are no window cranks—weather conditions are controlled within the car and there is no need to lower the windows.

A dream-car indeed—but how much will it cost?

About $700 for a light car, is the best guess of engineers. Some super-optimists place the figure as low as $300. For a super-duper luxury car in the Packillac class the figure may be as high as $2,000.

But this quick preview gives you only a faint idea of the prize package you're getting. Perhaps you think a plastic body will crack like an egg. Henry Ford has already exhibited a cream-colored plastic car which, struck by a sharp axe in the hands of a husky man, shrugs it off without dent or blemish. Surprisingly, such a plastic has ten times the impact-strength of a sheet-steel car. If you drive into a tree, your plastic car has ten times the resistance ability of steel. That bumper around the front is more psychological than anything else.

Ordinary bumps and sideswipings which would dent steel fenders leave no mark on plastics because they have natural resilience. A severe enough blow will crack plastic, of course, but will not leave the jagged, tearing edges that make sheet steel cause such frightful injuries. When you do ruin a plastic fender or door, just tear it off and put on a new one. It will be cheaper than the present process of hammering out and repainting dented steel. Plastic bodies will be built on the panel system—Ford's experimental car has fourteen of them—so that only the damaged section need be replaced.

Because plastic surfaces are glass-smooth and the color is built right into them, you'll never need to repaint your car. If it is encrusted with mud, wash it down with a hose. Otherwise merely wipe it off with a damp cloth and it will never scratch.

Ever cuss and fume when you tried to drive with a windshield coated with frost? Plastics will make defrosting devices obsolete. You can't fog or frost the transparent plastics Uncle Sam uses on his planes. Way up in the stratosphere around 30,000 feet temperatures dip to 60 below, and you can be sure that the Army wouldn't stand for frosted windshields that shut out all view of the enemy. But the new plastic-glass just doesn't fog!

Most of us have had the experience of parking a closed car on a hot day and coming back to find the interior hot enough to bake a cake. But not plastics! Their insulating properties are such as to make a car cooler in summer and warmer in winter. They admit the health-giving ultra-violet rays of the sun which ordinary glass shuts out, but keep out the red heat rays. One motor-car executive who spent

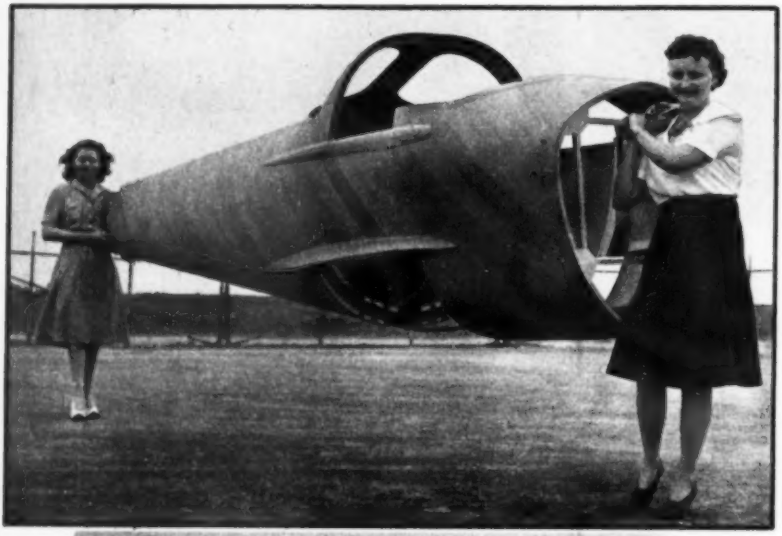
most of his vacation at the wheel of an experimental car with a transparent plastic top came home with a rich coffee-brown suntan.

For quietness a plastic body won't need to be doped up with sound-deadening substances. It is accoustically inert and deadens vibrations. Imagine a body that can't develop squeaks and rattles! And as for weight: Well, the Vidal Corp. is now making an entire plane fuselage of plastic which weighs just 54 pounds!

Do these advantages mean that plastic bodies are going to have everything their own way? Not at all! There are hundreds of plastics and there will be competition among themselves. Black plastic is one of the easiest to work with, and this means that some plastic cars may be coated with baked enamel coverings to give desired colors.

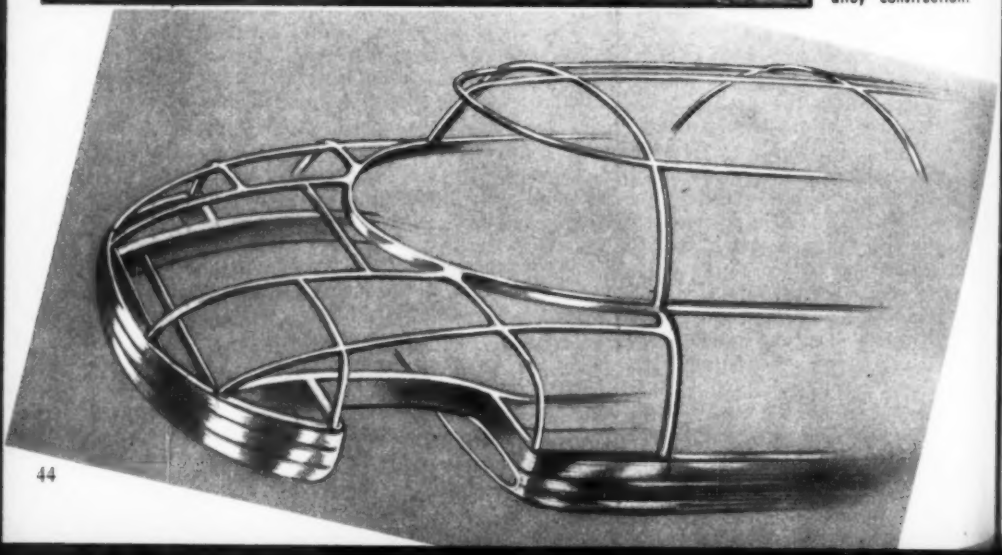
But the real competition will be between plastics and light metal alloys—aluminum and magnesium. Certainly we will have some cars with magnesium and aluminum bodies, because of the tremendous increase of production of these metals in war time. Plastics themselves must be mounted on tubular framework because they have less tensile strength than steel. General appearance and features of an aluminum car will not be significantly different from plastic models. Either design will reduce weight.

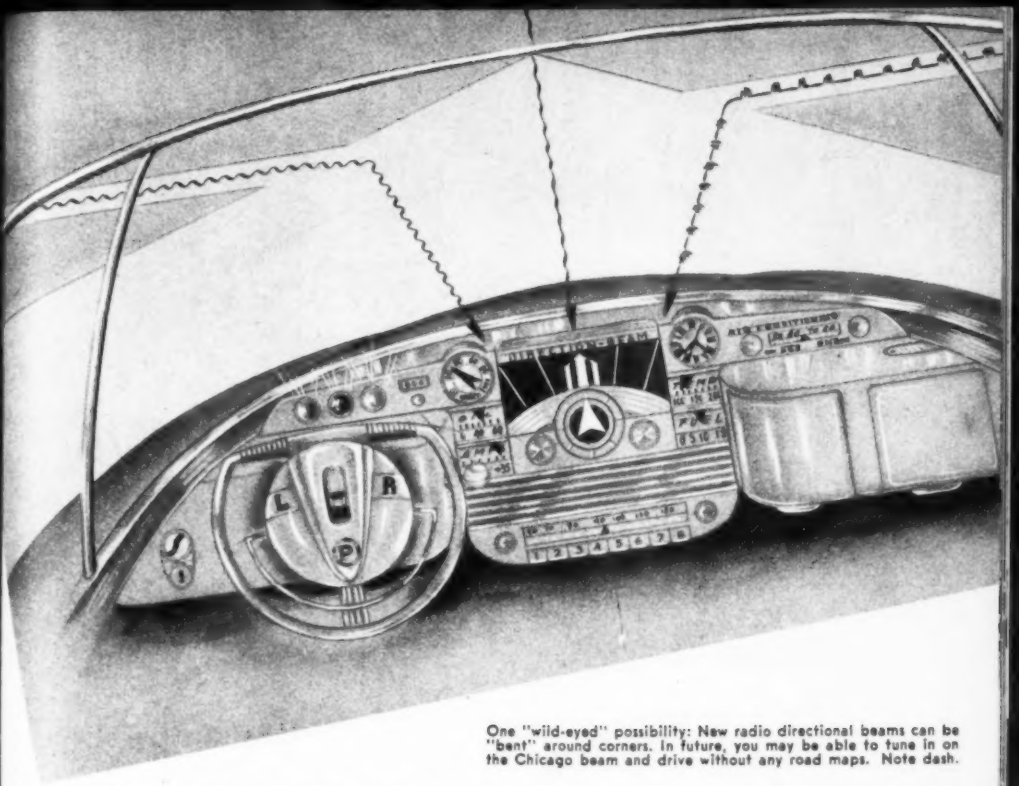
Airplane makers may be the ones to produce light-alloy cars. They're the world's experts in working with light metals, and new



Here is an all-plastic plane fuselage weighing only 54 pounds. It will be possible to make motor bodies by the same process.

New welding processes will revolutionize automobile frame design after the war. Below is all-tubular metal alloy construction.





One "wild-eyed" possibility: New radio directional beams can be "bent" around corners. In future, you may be able to tune in on the Chicago beam and drive without any road maps. Note dash.

defense plants are turning out these materials in terrific quantity. It is anticipated that aircraft builders, having learned the secrets of astounding mass production, will compete with old-line auto makers right in their own back yards after the war. Certainly aerodynamic design will come into its own—a car already designed for Packard is distinguished by two vertical fins at the rear, like the rudders of an airplane, to give it added road steadiness.

Lightness will come not only from body design but from the new chassis. Here, although steel will still be used for many essential parts, light metals will have a field day. The tremendous strength necessary for a fighting plane has paved the way for auto chassis girders, engine mounts, and structural members of magnesium and aluminum alloys.

Moreover, these will not be manufactured in the old bolt-and-rivet fashion. Welding is revolutionizing construction practices. One workman is now able to put frame members into jigs, touch a button, and weld the separate pieces into a single unit strong as a bridge. There will be no bolts to come loose, nothing to rattle. And the labor cost will be greatly reduced. It is even probable that the entire frame of the car [*Continued on page* 147]

YOUR NEW HOME AFTER THE WAR!

Next month, MECHANIX ILLUSTRATED will present the second in its series of "A World You Never Knew" articles. The second will tell you the marvels of the new home some 20,000,000 of you will build in America when the war ends. It will show graphically the wonders which "rush research" on housing methods during the war have created—houses that are marvels of scientific precision and beauty. By Donald G. Cooley, with illustrations by MARTIAL & SCULL and NORMAN BEL GEDDES! Don't miss this sensational article!

JACK and GENE

Meet Jack-wise Gene Meyers of Memphis, Jack-Repair Tycoon at 16!

by Emmett Maum

JACKS mean jack to 16-year-old Eugene Meyers of Memphis, Tenn. One of the country's few authorities on hydraulic automobile jacks, he has made as much as $190 a month operating a jack-repair shop, getting business from all over the South as official representative of 25 national companies.

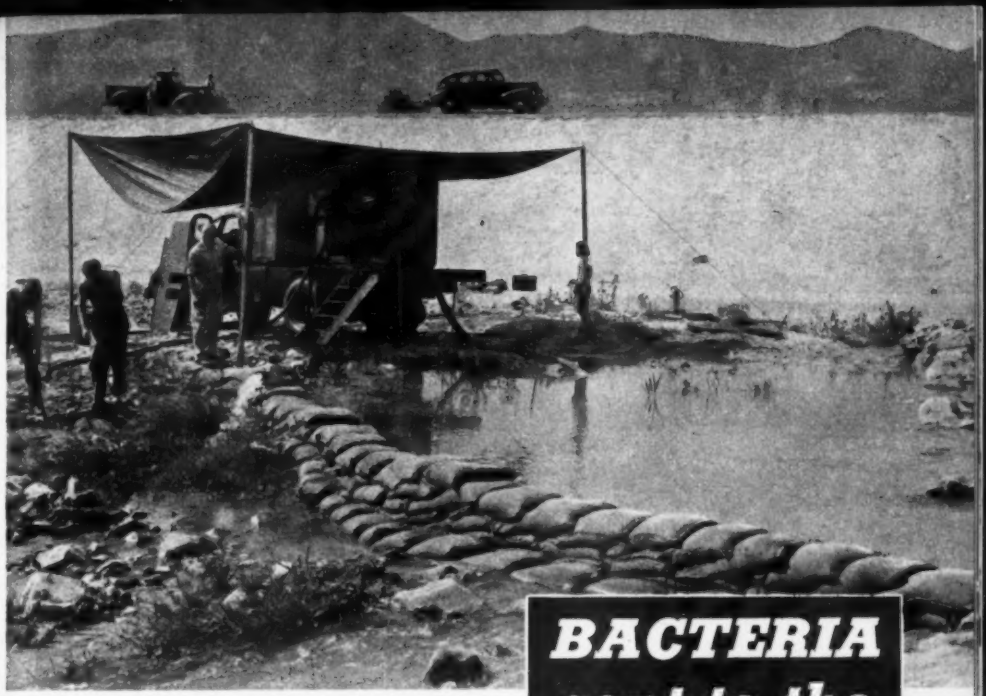
Gene's expertness stems from five years' experience—he began working with jacks when he was only 11 years old! He was a $2.50-a-week helper then in the jack hospital he now owns, supposed to confine his eager fingers to cleaning parts and picking up tools. But he wanted to do more, started reading books on how to fix the hydraulic jacks. It's a technique so complicated that the average person has slight chance of mastering the work. Gene seemed to have a knack for it, though. He learned how to take a jack apart, discover what was wrong, fix it, and re-assemble it.

His present skill is a marvel even to his proud father, himself an auto mechanic, who helps out his son when the patients crowd "Gene's Jack Hospital." Though familiar with jack repair, Mr. Meyers says, "When I take a piece of mechanism apart, I line up the parts. That makes it easy to put them back together. I can tell at a glance what part comes next. But Gene . . .!

Top: Gene, 16, long ago mastered intricate hydraulic jacks. *Right:* Testing a jack's pressure.

"When Gene tears a jack apart, he just dumps all the parts together in a pile. He knows them so well by now that he doesn't lose a minute looking for a part when he wants it. He can pick it right out, even if several look just alike."

A full-time employe for an auto parts dealer this summer, [*Continued on page* 161]



Bacteria in this polluted stream are electrocuted in the unit on the truck. Result meets top requirements for drinking water.

BACTERIA sent to the ELECTRIC CHAIR

Bacteria are burnt out of water to assure potables' purity to soldiers in the field.

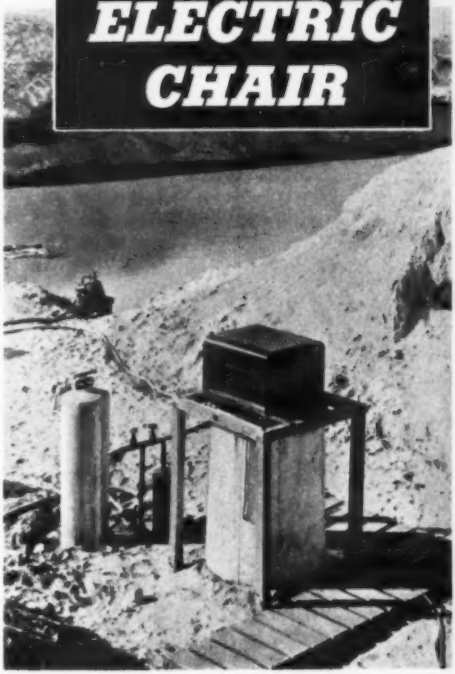
by Robert J. Green

A SIMPLE, automatic purification machine that literally burns bacteria out of water is proving to be one of the most important developments in the war program.

"The supply of an adequate amount of pure water," says Captain R. R. Arnold of the Army Engineering Corps, "is a matter of utmost concern to the entire army."

He might well have added "to the entire world." It was an understatement, considering the surrender of Singapore and Hong Kong, for example. Those two mighty fortresses, manned by thousands of soldiers with plenty of ammunition, fell when the defenders were deprived of, among other vital factors, their drinking-water supply.

Immediate concern was expressed for the similar safety and health of the rapidly growing United States Army. Increase of troops called for vast quantities of chlorine, generally used for purifying water. But the chlorine supply, being limited, was among the first chemicals put [*Continued on page* 155]



New, small water-purifiers like this can be set on any shore.

Turn Your Hobby Into Cash

by Dave Elman,

Conductor of the famous radio show, "Hobby Lobby."

Let this famous authority on hobbies tell you how others have turned their pastimes into money. You can, too!

The author, Dave Elman, showing wooden figures that made money.

Roy J. Snell, of Wheaton, Ill., started collecting old trunks—and found there was a fortune in them.

NO MATTER what kind of hobby you have there's a chance for you to turn it into a small, private gold mine. Let me give you a few illustrations:

J. C. Chalmers, a Los Angeles plumber, made candy as a hobby. He liked to experiment with different recipes, and by and by his candy was so delicious his friends insisted on buying it from him regularly, and he developed a lucrative spare-time business that in no way interfered with the pleasure he derived from his hobby. After a time he started to experiment with making candy in the form of small figures, toys and other objects. Almost overnight he found himself in movie work. It happened when one of the studios ran into a problem: the movie plot they were working on required the heroine to walk through her garden absent-mindedly picking flowers and eating them. Chalmers got the job of creating a garden of flowers

Howard Klein, a Philadelphia printer, studied hypnotism for fun, but soon discovered his talent made him in demand for stage engagements and radio.

made of candy so the star could eat them; she refused to eat real ones! Soon Chalmers was making straw hats out of candy for a screen comedian who chews up his hat. He also made plate glass from candy to be used in shots where the actor is in an auto accident and goes through the windshield. You guessed it—Chalmers isn't a plumber any more!

Miss Delphine Binger of New York had an unusual hobby. She collected wishbones. She would engrave a message, such as a birthday greeting, on the bone itself, tie a ribbon on it, or some little doo-dad symbolic of the occasion, and send it to a friend. For instance, to a friend who was going on a fishing trip she sent a wishbone with a suitable greeting, some pretty ribbons and a miniature fishpole. To a new mother she would send a wishbone, prettily decorated and engraved, with a tiny cradle or pair of baby shoes attached. She sent them to all her friends, like greeting cards, for such occasions as anniversaries, parties, illness, new business ventures, and every other sort of occasion. Her friends were charmed.

In fact they were all so enthusiastic that one day it occurred to Miss Binger that people might want to buy them, just as they buy regular greeting cards. She made up a wishbone in the form of a calling card and sent it in to the buyer of a department store. She left the store with her first order—$77.55. Today those novel wishbones, started as a hobby, are sold in stores throughout the country. Incidentally, she uses chicken, duck, goose, turkey and squab wishbones, and obtains them from farmers, restaurants, cafeterias and private homes.

Sidney Lubin turned his hobby into a job. His hobby had been making musical instruments out of odds and ends. One of the instruments he made was an organ with beer

Delphine Binger of New York started collecting wishbone, found that stores would buy them.

Wallace Block, Buffalo, discovered he could blow square, other weird soap bubbles—for pay!

bottles for pipes. It sounded amazingly like a real organ. Then one day Mr. Lubin found himself out of work, with no job in prospect. So he fell back on his hobby. He demonstrated his beer-bottle organ and got a job at Atlantic City where he played this instrument for years, at a good salary!

Wood-carving, a popular hobby, has often been turned into cash. Vernon V. Haff of Denver, Colorado, was sick in the hospital, his family in bad straits financially. His 11-year-old son got him interested in wood-carving, and while still in the hospital he turned out small western figures. The boy took them out and sold them. Today Mr. Haff, his health regained, has more orders for his work than he can fill.

Edward Kelly of New York, a

chauffeur, had a hobby of collecting driftwood along the beaches and carving it into all sorts of beautiful objects—end tables, lamp bases, cigarette boxes, picture frames and the like. Today he has a job teaching wood-carving to children—and to him it's the same thing as being paid to have a good time!

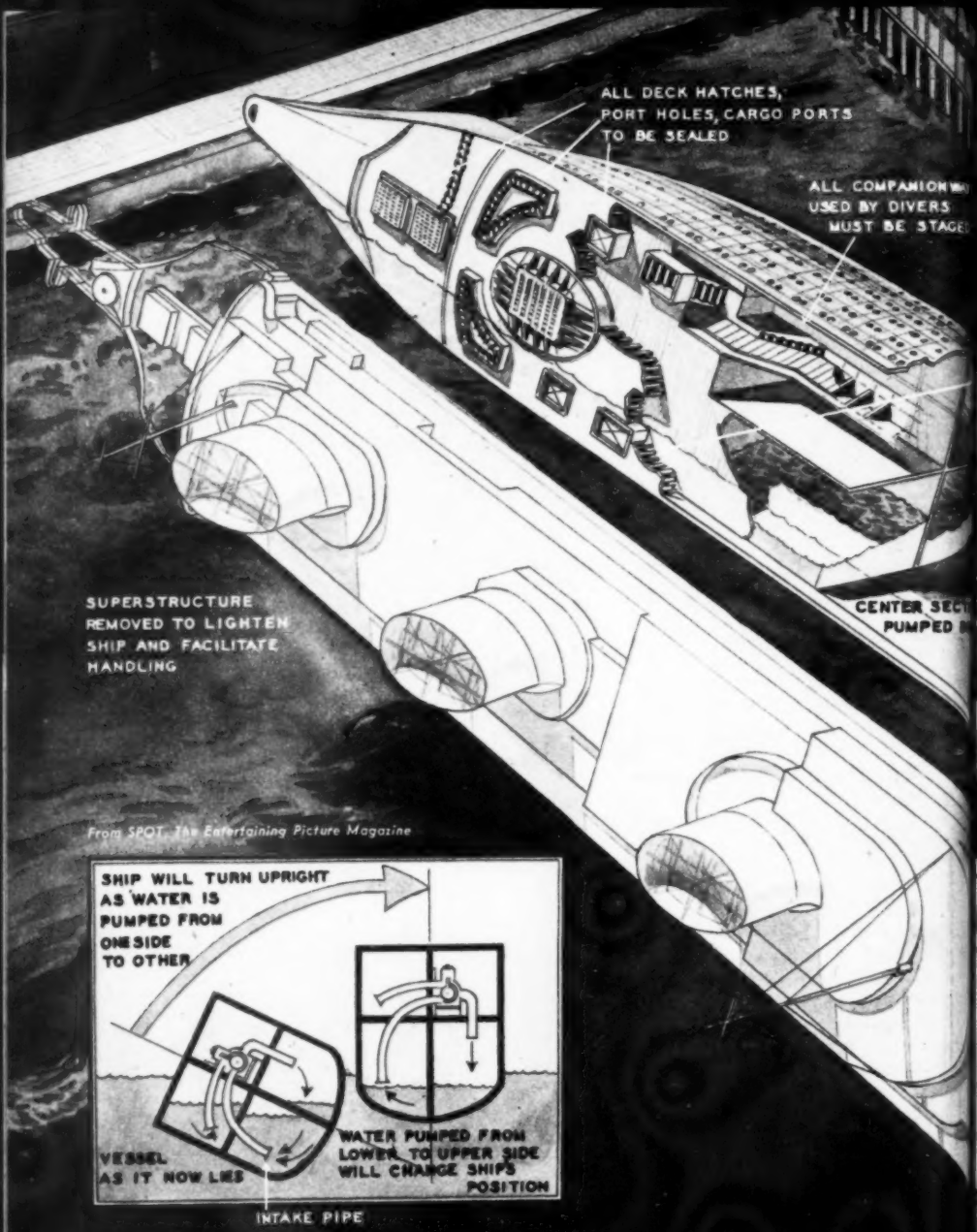
Marty Gilman, of Gilman, Conn., was always a football fan and his hobby was making dummies for football practice. He offered them to football players to try out, and they were enthusiastic. They talked about them. Almost overnight Mr. Gilman began to get orders for his dummies from colleges, to be used by their football teams. That was all right with Marty Gilman. He quit his job and devoted his entire time to his hobby. To date he has made and sold over five thousand football dummies for colleges all over the country.

"I hear so many good stories and I never can remember them." How often have you heard this remark or perhaps even made it yourself? Well, Irving Davidson, a New York attorney, had the same problem until he solved it by making a hobby out of collecting jokes and humorous stories. He's been at it for ten years, and now you have only to mention any subject and Mr. Davidson has jokes and stories about it. Cash? Oh yes—he's in constant demand as an after-dinner speaker at clubs, dinners, parties and other occasions. He just tells some of his stories—those best suited to the occasion—and receives a good fee.

Entering contests has long been a popular American hobby, and many of these hobbyists are cashing in on it. It is a well-known fact that some contest enthusiasts actually win thousands of dollars each year. But Helen King, of Buffalo, N. Y., cashed in on her contest hobby from a different angle: she entered so many contests and won them that she was offered a [*Continued on page* 147]

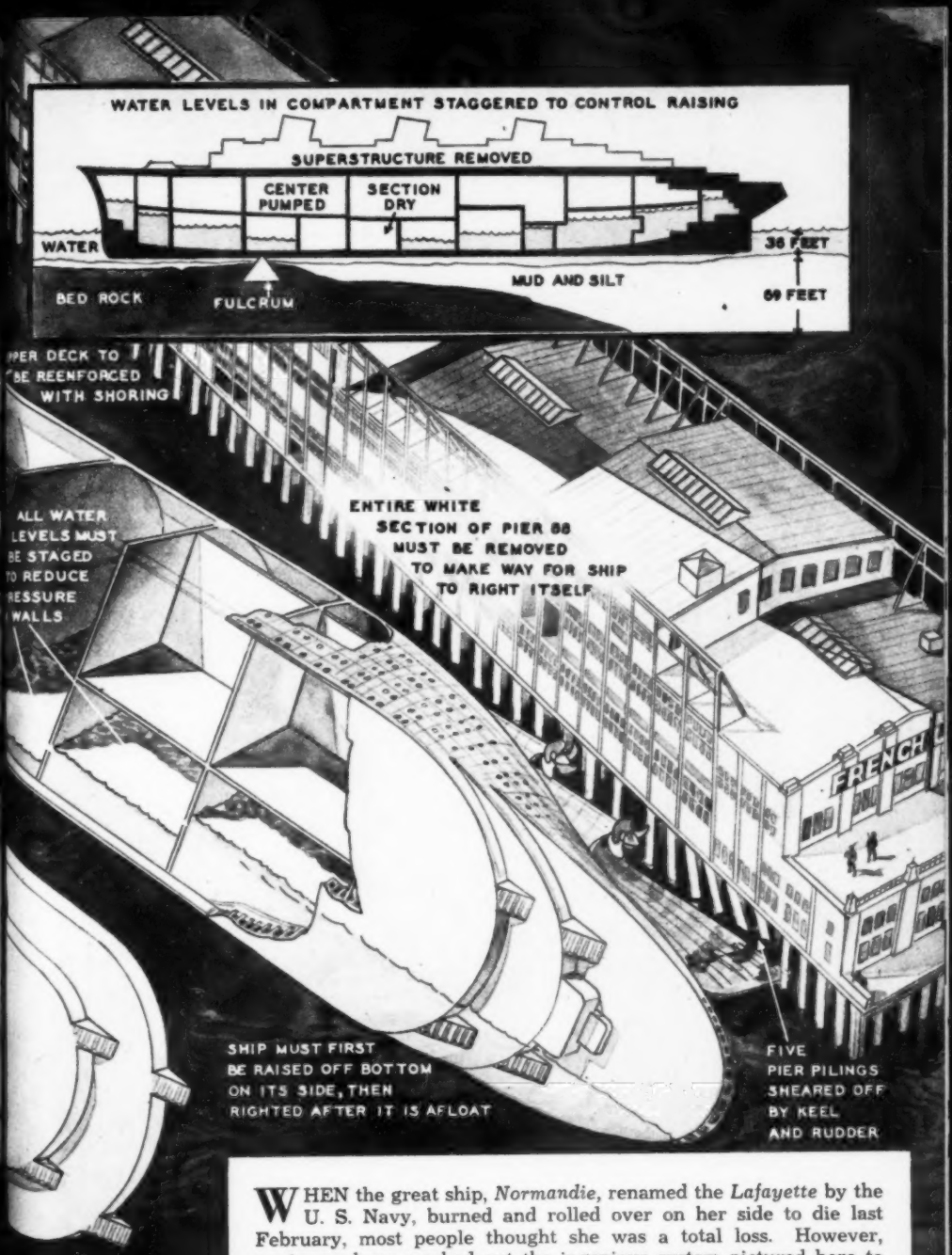
Nancy Forbush, Cleveland Heights, Ohio, started making marionettes when she was 11. They made money— she even showed them in the White House.

Farmer John Cz, Madison, Ohio, grew pumpkins into molds, now sells them to many flower shops.


ALL DECK HATCHES, PORT HOLES, CARGO PORTS TO BE SEALED
ALL COMPANIONWAYS USED BY DIVERS MUST BE STAGED
SUPERSTRUCTURE REMOVED TO LIGHTEN SHIP AND FACILITATE HANDLING
CENTER SECTION PUMPED
From SPOT—The Entertaining Picture Magazine
SHIP WILL TURN UPRIGHT AS WATER IS PUMPED FROM ONE SIDE TO OTHER
VESSEL AS IT NOW LIES
WATER PUMPED FROM LOWER TO UPPER SIDE WILL CHANGE SHIPS POSITION
INTAKE PIPE

Raising The Normandie

160,000 tons of dead weight are being lifted in the biggest salvage job ever attempted in history.


WATER LEVELS IN COMPARTMENT STAGGERED TO CONTROL RAISING
SUPERSTRUCTURE REMOVED
CENTER PUMPED
SECTION DRY
WATER
36 FEET
MUD AND SILT
BED ROCK
FULCRUM
69 FEET
UPPER DECK TO BE REENFORCED WITH SHORING
ALL WATER LEVELS MUST BE STAGED TO REDUCE PRESSURE ON WALLS
ENTIRE WHITE SECTION OF PIER 88 MUST BE REMOVED TO MAKE WAY FOR SHIP TO RIGHT ITSELF
FRENCH LINE
SHIP MUST FIRST BE RAISED OFF BOTTOM ON ITS SIDE, THEN RIGHTED AFTER IT IS AFLOAT
FIVE PIER PILINGS SHEARED OFF BY KEEL AND RUDDER

WHEN the great ship, *Normandie*, renamed the *Lafayette* by the U. S. Navy, burned and rolled over on her side to die last February, most people thought she was a total loss. However, engineers have worked out the ingenious system pictured here to right her. After sealing all ports and openings, they will remove the superstructure, clean out all debris, then start pumping her out. Water will be pumped to different levels in various sections to balance her properly, then to roll her upright, as shown.

I FILMED THE WORLD

by Ted Genock, Ace Paramount News Cameraman

The thrilling adventures of a movie maker on a 60,000-mile assignment to cover war.

THOUGH expected, it took us by surprise when the bugle call sounded urgently from somewhere amidships. It was the brassy, staccato call of the Alarm to Arms. Multiple nasal echoes resounded from the myriad loud-speaker on all decks, and even from the bowels of the ship, with the sharp decisive order, "Action Stations .... Action Stations!" The big battlewagon trembled slightly and heaved as it turned a few degrees north-eastwards. The accompanying units of this squadron of His Majesty's Fleet turned in geometrical pattern, opening up in a maneuver tactically known as Crossing the T. Far away in line with the setting sun, which rim-haloed in brilliant yellow the attendant cumulus clouds, three thin streaks of smoke fluttered skyward. It was

Left, the author in his war correspondent's uniform. *Below*, a shot of actual tank warfare filmed by Genock in the burning Libyan desert.

AT WAR

Cameraman Genock in a British reconnaissance plane over Libya. He took first movies of an Allied bombing mission. *Right*, Genock shoots a Jap air raid over Chungking, in China.

all that we could see, even through powerful binoculars.

Through the longest lens of my camera and on the focussing screen it looked like a picturesque and peaceful seascape. But here at last, was the enemy. The cause of those trailing veils in the sky, was three units of the Italian Fleet.

The next movement in this symphony of Action at Sea, was the hurried but assured patter of running steps—up ways and hatches, down iron ladders, and along echoing steel-pipe-entwined corridors, merging as in a crescendo with the repeated percussion of bulkhead doors closed with the slam of steel. All the noises finally fading to a silence that was broken only by the ring of signal bells between bridge and gun-turrets—the order to load guns and stand-by. This was July, 1940. I waited expectantly, my hand on my camera release, with the thrill of the newsreel man who knows that he is just about to scoop an exclusive. We had lived through forty minutes of expectant and active excitement. For, out of a lazy Mediterranean afternoon and on the way to join a convoy on protection patrol, our ships had suddenly turned off course. A signal had been received from a Sunderland Flying Boat on reconnaissance duty, reporting the presence of Italian naval units off the Sicilian coast. The interval was occupied in the usual preparations. The wardroom and many cabins were stripped of loose fittings, fans, pictures and ornaments. Anything loose on deck was battened down. This was my first encounter with the really serious activity of a battleship. I had filmed many maneuvers

Above, the war cameraman must carry all his own food, water, equipment and cook all his own meals. In the desert sand, it can be a problem. Below, here is an anti-aircraft action shot filmed within besieged Tobruk, Libya.

at sea, and strangely enough, except for an underlying almost pleasurable sense of excitement, there was little to show that this might still be nothing more than a war game.

But now, exactly at the time and place estimated by the navigating officer, on the assumption that the enemy was unaware that we were on his track, were the first signs of our objective. Out of the waiting silence now, another bell-signal rang.

Wh . . . oom, wh . . . oom, wh . . . oom! . . . The instantaneous answer was an air convulsion that seemed literally to shake the sky—an optical illusion to be seen from my position behind the powerful gun-barrels, and caused by the waft of hot gases which obscured the sky in shimmering fantasy at the same moment that the wave of concussive explosive shook the camera and rocked my whole body. As if in chorus, the other ships of the squadron thundered out the same steel-hurtling rhythm.

There was enough to think about technically, enough to cover the excitement that one experiences in being in the front seat, at a naval action. My photographic difficulties, however, were increased a hundredfold by the result of the "self-protective" instincts of the Italian units, who turned, made steam and hared away directly into the setting sun, meanwhile straddling us with unexpectedly accurate fire.

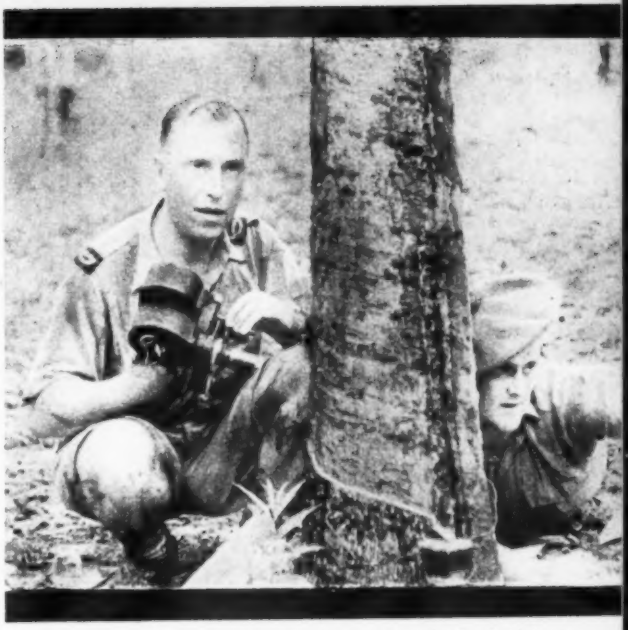
Our frothing wakes traced parallel curves on the sea as we followed at maximum speed, reducing the range to 9,000 yards. Now, not only "shooting" into the light, I had to contend with a continual cleaning of my lenses as spasmodic showers of spray broke over the deck. Aloft, a sailor was cursing lustily as he was kept busy, wiping dry the glasses of the rangefinder.

Since that early naval experience of this war, I have filmed land and air actions in Libya, Greece

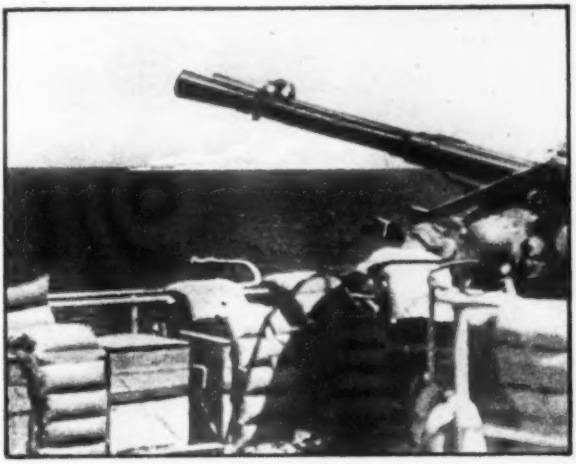
and Albania, with the Australian and British troops in Syria, down to Abyssinia and with the Indian troops in the Sudan and Eritrea, and meeting the Russian troops in Iran. Then across India to the Far East in Java and Borneo, returning via Australia to my starting point in New York. Nine hundred days across the War Fronts of the world, traveling, mostly by air, a total distance of over 60,000 miles, or rather more than twice the distance round the world.

As an accredited correspondent, one is attached to the Public Relations Departments of the Fighting Services, and thus many of the peace-time difficulties of the newsreel man are obviated. His requests for filming various activities, or to join various forces in action, are considered and granted by military headquarters. Many facilities for transportation, by bomber planes, military trucks or naval vessel are often supplied. Other varied difficulties, however, beset him. Each front and each territory has its own particular problems. Clothing, language, troops, quality and quantity of light, heat and humidity. All these are variables, the permutations and combinations of which form the working background of the nomadic war cameraman. Filming in Libya, during the desert fighting, may give some idea of one set of working conditions.

A camouflaged truck, supplied by the Army Department, becomes the war correspondent's home from the moment he leaves his base in Cairo. Abroad, he carries everything necessary for living and working. He *must*, by regulations and agreement, be completely independent and self-supporting. Thus he carries food, water (in an army-pattern 9-gallon can), gasoline, sleeping-bag, and his equipment and spare film. Thus he is theoretically independent of army supplies, but that does not mean that he lives, always, a solitary Bedouin life. The most pleasant memories—and I have many of the Western Desert, though the majority are more pleasant in retrospect, than they were in actual reality!



Here is Genock shooting the Fall of Singapore, while under fire in Malaya.



Above, a scene by Genock showing Italian destroyer sunk by British ship.

—were of the evening meals at an officers' mess, at one of the many brigade or divisional headquarters that one reported to. A simple meal under the stars in the cool of the evening, when war, just across the desert wadies, yet seemed so far away.

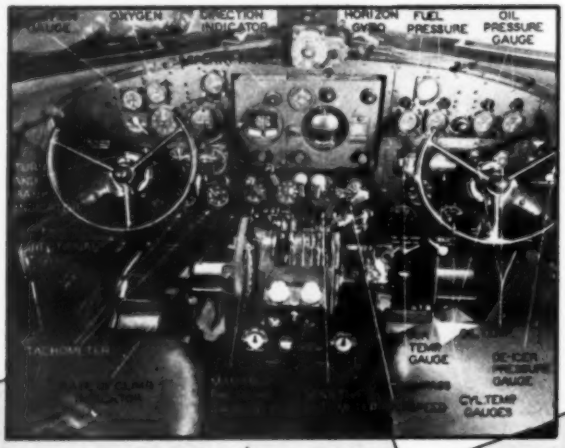
The real problems of Libyan coverage for a newsreel man are in the working conditions. His difficulties commence from the moment that he [*Continued on page* 152]

HOW PLANE

Aircraft instruments do such amazing things that the layman often thinks they're more complex than they really are. Here's an easy way to understand them.

AIRCRAFT instruments are really quite simple in principle. While there are usually several different types of each instrument, we are explaining the commonest types here.

Many instruments employ a metal diaphragm, which is pretty much like a flat tin can. In the case of the altimeter, the flat tin can has a hose stuck in it—with the other end of the hose pointing out of the front of the plane's wing so that the wind can blow [*Continued on page* 157]



This is the instrument array in a DC-3. Instruments are simple in principle although delicately constructed. The panel is not as complex as it looks because instruments are divided in purpose. One set tells engine condition, another tells flight attitude and aerodynamic data, and others provide navigational information. The pilot looks at the ones that deal with the information he wants. He doesn't attempt to watch all simultaneously.

ALTIMETER
If you were an altimeter you would work like this
Aneroid Cell
Altimeters contain a hollow metal shell called an aneroid cell. As the plane rises, atmospheric pressure drops and the cell's "cheeks" swell out, thus moving a dial pointer.
A

Common tachometers have weights that swing out from a shaft as it turns. With more r.p.m. they swing farther out, moving a gear and lever system to a dial.
Very High R.P.M.
Higher R.P.M.
Low R.P.M.
TACHOMETER
B

AIR SPEED INDICATOR
Air speed indicators have metal diaphragms attached to a "pitot-static" tube, into which wind blows as plane moves forward, swelling diaphragm which moves dial pointer.
"Wind" blows in here
Small holes equalize pressure
C
Mr. Diaphragm gets his cheeks blown out bigger as "wind" increases with air pressure
H

INSTRUMENTS WORK

TURN AND BANK INDICATOR

Bank indicator is fluid-filled glass tube with a ball in it. When plane banks, ball rolls. In correct turn, centrifugal force holds it in center. Turn indicator is wind-driven gyro that moves pointer as plane veers to one side or another.

TEMPERATURE INDICATOR

There are several types of temperature gauges, the commonest, perhaps, is the kind that operates by gas expanding in a tube when heated. A metal container at the heat source connects by a tube to a Bourdon tube in gauge. (See below.)

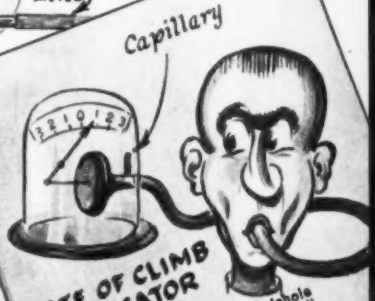
OIL PRESSURE INDICATOR

Pressure gauges commonly contain a metal Bourdon tube that works on same principle as New Year's "snake" at left. Same idea is used in temperature gauges where expanding gas in closed container bends out tube as heat increases. In oil gauge, oil under pressure goes directly into Bourdon tube inside the indicator.

ARTIFICIAL HORIZON

Artificial horizon is like a wind-driven top. Air pressure from several air jets turns turbine on gyroscope shaft. When plane tips in any direction, gyroscope (like a child's top) remains vertical as does "horizon" attached to it. Horizon drops when nose is up, rises when the plane's nose is down.

RATE OF CLIMB INDICATOR



Climb indicator is like leaking tire. Falling pressure in climb shrinks diaphragm which is made with pinhole "leak," or capillary. When climb ends, large tube "sucking" ends, and diaphragm "leaks" back to normal shape, pointer goes to zero. In dive, diaphragm swells out, "leaks" fast when plane levels off.

The proud, mighty *Lexington* in the Atlantic in 1939.

Eye-Witness Story!

I Saw The END OF "SEA POWER"

by Stanley Johnston

of the Chicago Tribune

Only Correspondent to Witness the Battle of the Coral Sea

The Battle of the Coral Sea, the first great defeat ever dealt Japanese fleets, was the first battle of its kind in all history. It was a naval engagement, yet it was fought entirely in the air. The surface fleets never saw each other, and during most of the fighting were from 80 to 180 miles apart. Twenty-three Japanese vessels were sunk, only three U. S. ships. As the first "sea battle" in history fought solely by airplanes, it marked the end of conventional "sea power." No warship fired a gun except in defense against airplanes.

This condensation is published by arrangement with the Chicago Tribune.

WE ARRIVED in the Coral Sea battle area two weeks after leaving Pearl Harbor, cruising fast and secretly on a course out of sight of islands. Airplane patrols from the *Lexington* and the second carrier with a retinue like ours, had been kept ranging 200 miles on all sides during the 5,000-mile trip. Early on May 3 they reported Jap "snooper" planes which escaped into the high cumulus clouds. Everyone's vigilance was high from then on, and the long trumpet call and gong for battle stations sounded frequently as radio calls came in from the air scouts. In the ship's radio room I listened in on the slangy talk between scout planes and between them and the carrier. In the afternoon a scout called in

Blasted by Jap planes May 8, the 33,000-ton *Lexington* was victim of the same sort of attack she herself had launched.

STANLEY JOHNSTON

Ace correspondent Johnston's admiration for the heroic fighting of the *Lexington's* crew—first in beating off the Jap air attack, then in battling the fire which eventually was fatal to the ship—is evident in every line of his detailed dispatch. That his own heroism was an inspiring example to the men whose life he'd shared for weeks was modestly omitted—an oversight remedied later by naval officials. On the plea that he wanted to save his valuable notes and records, Johnston repeatedly returned to the dangerous inferno below the *Lexington's* deck to rescue men overcome by heat and smoke.

He wrote his story later from memory and from a few notes he had on him when he slid down a rope into the sea at the last minute. Now he's turning it into a book to be published this fall.

that there was a concentration of enemy shipping at Tulagi, capital of the British Solomon Islands.

Rear Admiral Frank J. Fletcher*, who had taken command of the augmented task force, ordered "high speed cruise" and the flotilla knifed northward at 25 knots all night. "General quarters" at dawn sent every man to his station. Close to Guadalcanal, the pilots were told "From your take-off it's a 120-mile shot straight north to Tulagi harbor. Go up over the mountains of Guadalcanal and come down out of them in your dives for the Japs." Dawn in those latitudes comes about 6 o'clock and, at 6:15, 18 Douglas scout-bombers were launched, then 18 heavy dive bombers, and last, 18 Douglas TBD three-place torpedo bombers.

According to a dive bomber who returned from the raid in less than an hour, the Japs' first warning of attack on the busy, ship-crowded harbor was the moaning of an over-speeding engine as the scouts and dive bombers plunged straight down from their height toward targets selected by the squadron leaders. At least two heavy bombs fell smack on the decks of a heavy cruiser. Flames licked 200 feet into the air, the ship staggered.

* Subsequently granted the Distinguished Service Cross for his part in the battles of the Coral Sea and of Midway Island.

Debris flames on the water and smoke pours from one of the Jap carriers set ablaze by U. S. Navy planes in the Coral Sea.

and began to settle at once. Explosions among smaller craft tossed lighters into the air, spilled men into the water, shattered wooden auxiliaries. When the smoke cleared one destroyer was already under water, another was turning over, and the tender was in trouble.

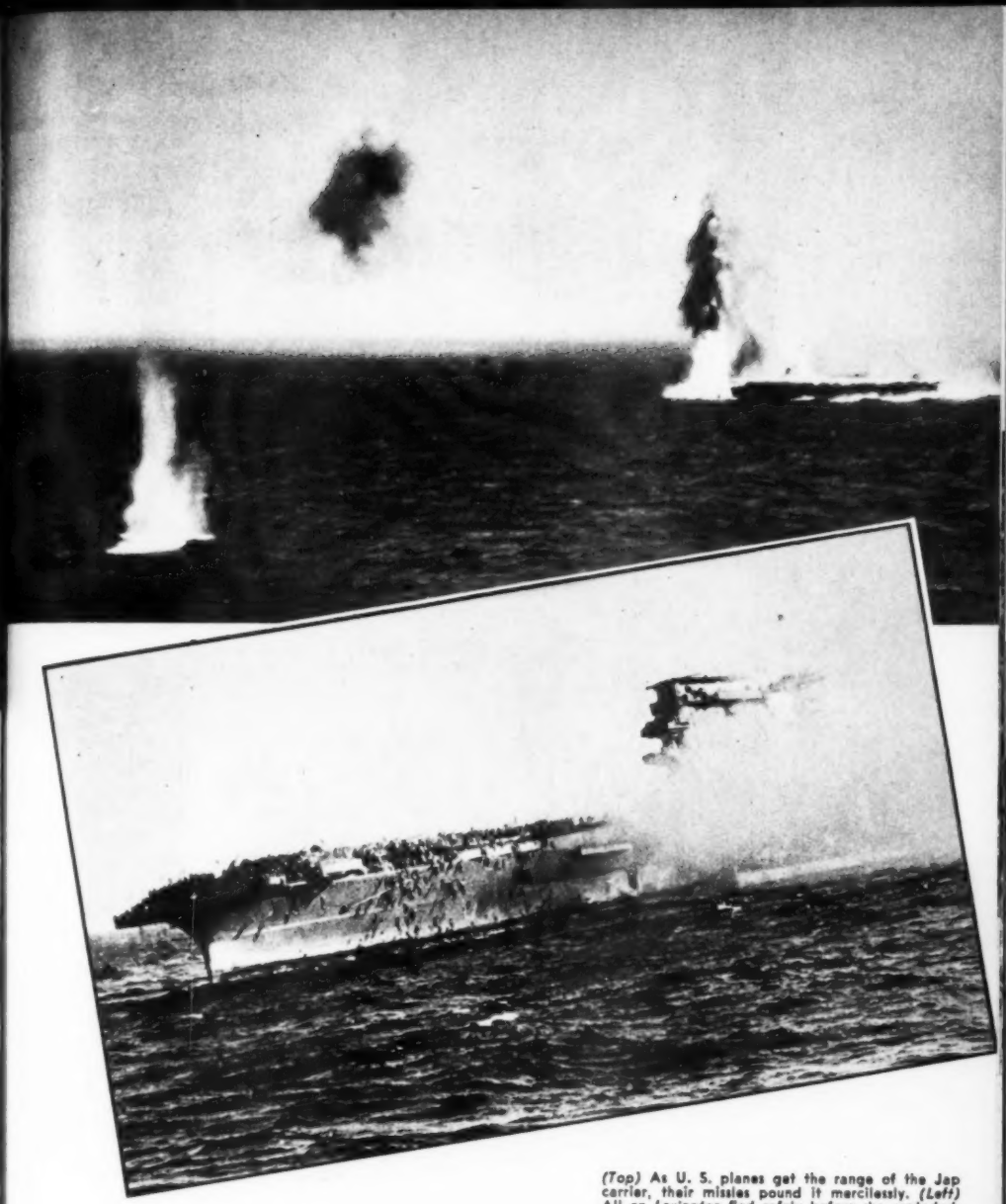
The Americans re-formed when their ammunition was exhausted, and found that not a pilot was missing! Back at the carrier in half an hour, the formation demanded quick refueling and re-arming, and by 11 a. m. was back in the air to hunt down fleeing vessels and to finish the harbor attack. More ships were sunk on this second raid, yet when the dive bombers returned in a couple hours they complained of seaplane-fighter interference and said some ships still in the harbor were not sunk. At 3:30 p. m. 18 dive bombers escorted by two teams of fighters went back to finish the task.

The pilots destroyed 14 out of 15 warships and transports, besides three seaplane fighter planes. We lost no pilot or plane due to Japanese action, though two fighter and one torpedo-bomber pilots overstayed their fuel limits in their enthusiasm. They crash-landed on Guadalcanal and were picked up later. That eventful, successful day, May 4, was the first stage of the battle of the Coral Sea.

On May 5 and 6 we refueled at sea without stopping, via hose lines to tankers steaming alongside.

In the afternoon of May 6, our air scouts located the first of two pincer fleets the Japs had dispatched to control the Coral Sea. It was 250 miles to the north and was described as two big carriers, four heavy cruisers, and a dozen or more destroyers. We steamed hard to be in position to hit the Japs the next day. The Japs had split up during the night and our scouts found only one carrier, three heavy cruisers, and six destroyers. The U. S. air fleet stalking the Japs consisted of 24 torpedo planes, 36 scouts and dive bombers, and 16 fighter planes. They spotted the Japs 50 miles away, north of the island of Misima, about 8 a. m.

"We came over at 12,000 feet," Lieut. Comm. Bob Dixon explained later. "Enemy fighters barely reached us as we eased into vertical dives. They came right on down with us in a terrible free-for-all, staying with us right to the water. We went for the carrier first, and caught it by surprise. A number of planes were on deck, and one was coming up in the ele-

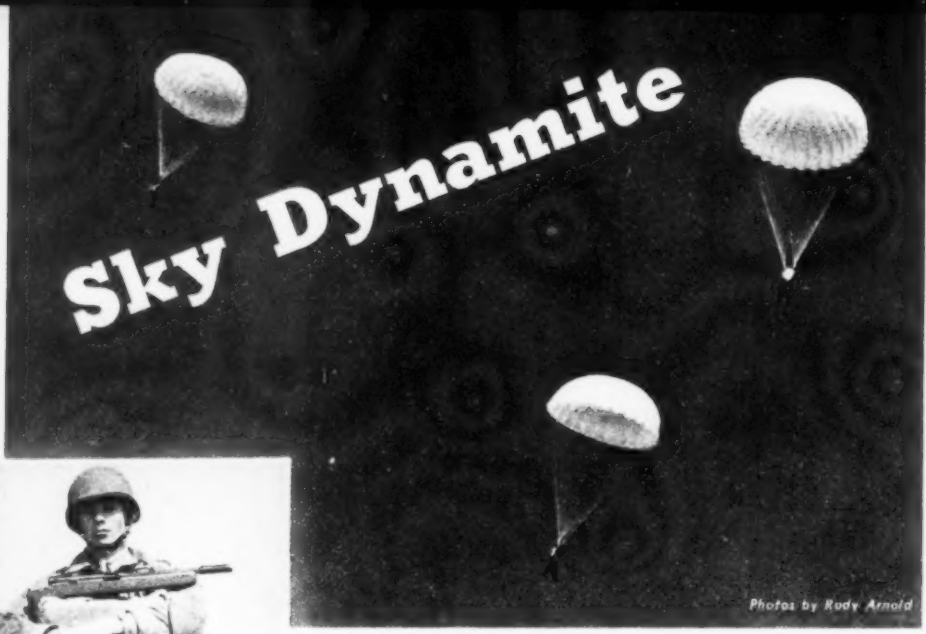


(Top) As U. S. planes get the range of the Jap carrier, their missiles pound it mercilessly. *(Left)* All on *Lexington* fled safely before she exploded.

vator." Dixon's dive was perfectly made, fighter pilots who had sat up at 16,000 feet with the heavy dive bombers told me later, and his 500-lb. bomb hit the Jap carrier deck amidships. Behind him two others made hits.

The scouts' dives had taken away the enemy fighter protection, so that the heavier dive bombers, toting their 1,000 pounders, were unhindered in their attacks. Lieut. Comm. Jimmy Flatley told me, "The sight of those heavy dive bombers smashing that carrier was so awful I was physically ill. The bombs followed each other at three- to four-second intervals and about every second one landed and exploded aboard ship. Those powerful explosions were [*Continued on page* 161]

Sky Dynamite



Photos by Rudy Arnold

Devil Dog paratrooper in full equipment. At left, Sergeant Roland Kachinsky. Note new type Reising submachinegun he has.

Advance scouts spread out as skytroops land. Here is Para-Sergeant J. F. Hennessy. See the folding wire stock on the machine gun.

HERE are the first released pictures of new U. S. Marine Paratroops—called "The world's toughest combat unit." Trained for special mission work, these paratroops probably will be most useful for back-of-the-lines demolition jobs such as the one portrayed on these pages. They have developed a special jumping technique which enables them to bail out of low-flying transport planes in such a manner that they land in a compact combat group. In photo at top of page, note how closely bunched are the three parachutists.

Radios drop from the sky with the Marines. Here *(below)* is Pfc. Weston Somand with "walkie-talkie" with which he jumps.

Right: The wrecking squad! Known as "demolitionists," they plant a TNT charge on rail, which is the object of this mission. Then—*above*—WHAM! The objective is accomplished!

The Marine 'chutists are equipped for radio command and frequently receive last minute orders while they are still in mid-air. One paratrooper jumps with a radio sending set strapped to his back, as shown in the photo on page 64. The Marines have developed special equipment for shock troop missions, such as the Reising sub-machinegun with its folding wire stock, pictured here for the first time. For more Marine paratroop pictures, turn the page.

Below: Corporal Neil Swanson, having stowed his parachute, advances to guard position with special light machine gun.

Paratroop Platoon Leader First Lieut. Pat Densman creeps forward to edge of wood, pistol alert, Reising gun slung.

Like Tarzan, Marines swing through the air to toughen arms.

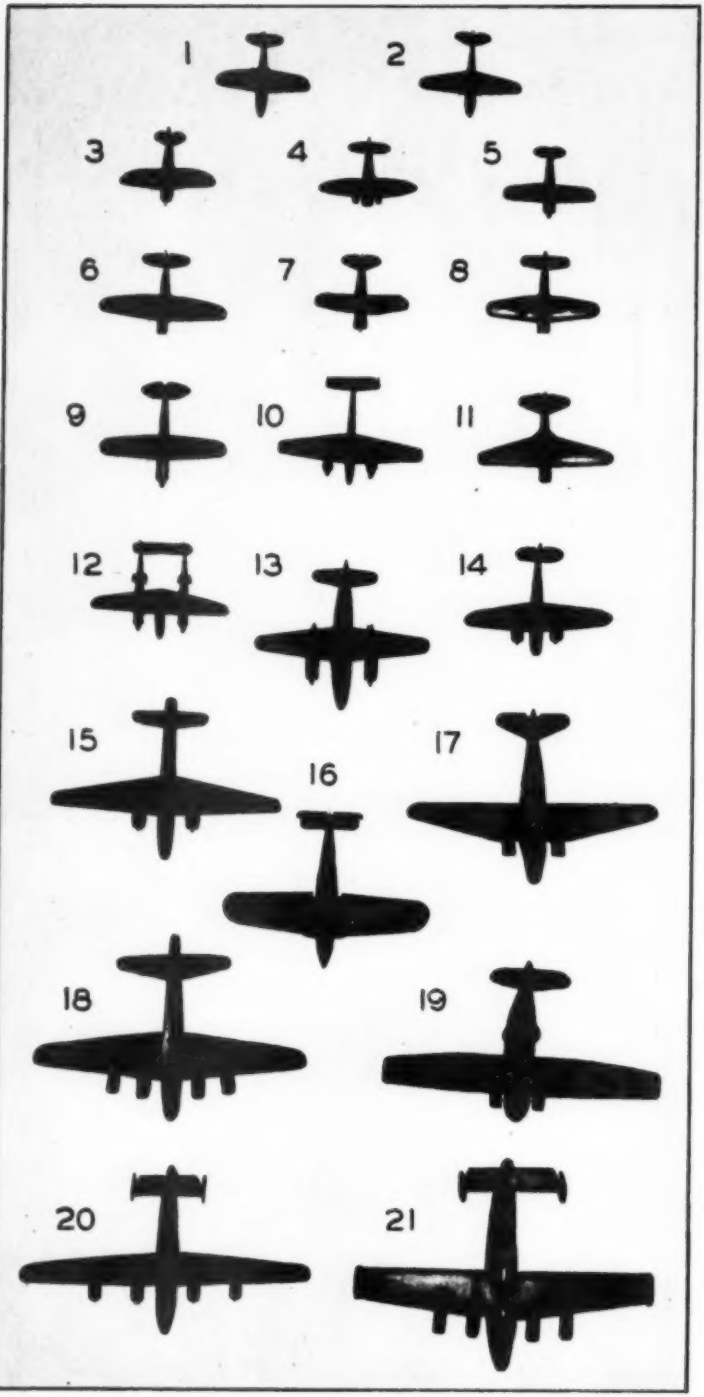
Left: A "'chute's eye view" of a paratrooper landing and about to spill the air from his shrouds. Note bulky equipment. *Above:* Eye-gouging is fair play in tough-and-tumble.

Marine paratroopers must go through strenuous training in order to become "the world's toughest customers." U. S. Marines in this arm of their service learn all the tricks of hand-to-hand fighting that British Commandos learn—and a few added American inventions in the art of rough and tumble. Their shoulder and arm muscles are given particular attention in this training, but the paratroopers also learn woodcraft, Indian tracking methods, and other specialties.

Any modern attack will begin with parachute raids. *Above*, a full platoon of Marine paratroops, showing full equipment.

Above: The way to disarm a man attacking you with a knife. *Below:* Handy footwork will spill a lunging bayonetter if you're expert!

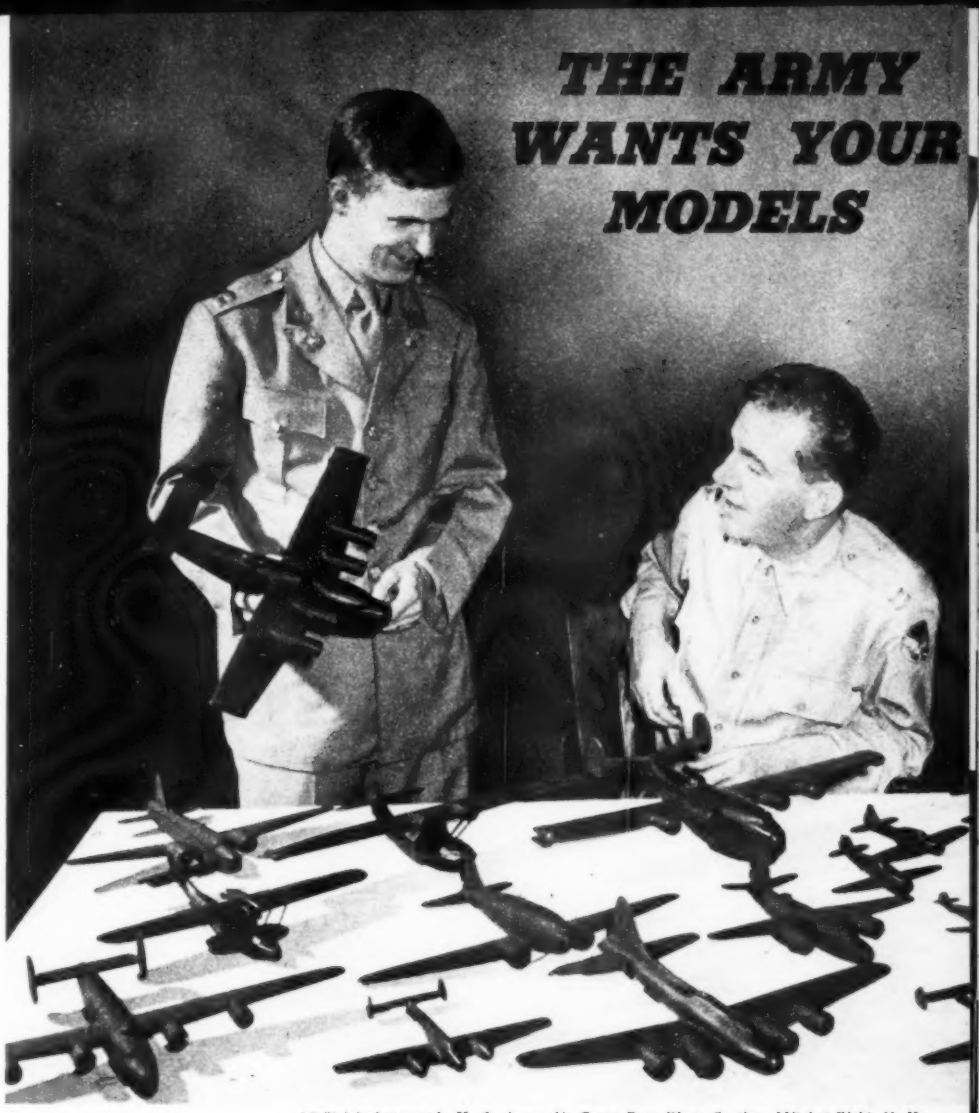
Here's another way to frustrate a bayonet attack.



You can see the relative sizes of famous fighting airplanes by comparing these models, all made to scale, under the Recognition Program.

1. **Bell P-39**
   U. S. Army fighter
2. **Curtiss P-40E**
   U. S. Army fighter
3. **Republic P-43**
   U. S. Army fighter
4. **Mitsubishi 96**
   Jap Navy fighter
5. **Brewster F2A-3**
   U. S. Navy fighter
6. **Northrop A-17A**
   U. S. Army attack
7. **Grumman F3F-2**
   U. S. Navy fighter
8. **Douglas SBD-3**
   U. S. Navy scout-bomber
9. **Brewster SB2A-1**
   U. S. Navy scout-bomber
10. **Messerschmitt ME 110**
    German army fighter
11. **Douglas TBD-1**
    U. S. Navy torpedo-bomber
12. **Lockheed P-38**
    "Lightning" fighter
13. **Martin B-26**
    Attack bomber
14. **Bristol-Blenheim**
    British bomber
15. **Wellington**
    British bomber
16. **Dornier DO18K**
    German flying boat
17. **Douglas DC-3**
    U. S. Navy transport
18. **Boeing B-17**
    U. S. Army bomber
19. **Consolidated PBY-5**
    U. S. Navy patrol-bomber
20. **Consolidated B24D**
    U. S. Army bomber
21. **Consolidated PB2Y-3**
    U. S. Navy patrol-bomber

THE ARMY WANTS YOUR MODELS



*Official photograph, U. S. Army Air Corps Base Photo Section, Mitchel Field, N. Y.

Captain A. K. Mills, seated, and Captain Ralph Millet of the First Fighter Command examine models at Science Clubs office.

FOR those of you model makers who were unable to co-operate earlier this year in the U. S. Navy recognition program, here is a chance to make models for the U. S. Army Air Force. If you will pledge yourself to make at least one model, you may receive free plans showing in detail how the model may be constructed by addressing your request to "Joseph Kraus, President, Science Clubs of America, Science Service, 310 Fifth Avenue, New York City." When your model is completed, you paste a slip on it bearing your name, address, age, the number of hours required to build the model, and the designation of the plane model which you have built. You send this model to Science Clubs of America at the above address. Science Clubs will forward your model to the First Fighter Command, where it will be used in training Army pilots in recognition and gunnery. You will receive a certificate from the First Fighter Command.

Junior Achievement, Inc.

An eager group of neighborhood boys listen intently as one of the adults sponsoring them tells them how to start a miniature business.

Teen-agers in 11 cities train for careers by operating real businesses!

by Louis Hochman

THE boy was young, not quite eighteen. He had just been graduated from high school and was now applying for his first job. His prospective employer eyed him skeptically, queried him about his education, then leaned forward and asked pointedly, "What experience have you had?"

"Why," the boy said, undaunted, "I was treasurer of my company for a year.

STOCK CERTIFICATE
This certifies that
shares, par value
is the owner of
each, of the capital stock of the
A JUNIOR ACHIEVEMENT CO.
This company is a unit of

Selling shares like this for 25-75 cents each raises $75-$100 capital.

Flushing, N. Y., boys operating The Oddity Shop produce merchandise in this attic workshop, that is reached by a store-room trapdoor *(right)*.

Before that, I was production manager, and . . ."

"Just a minute!" cried the employer, bug-eyed from surprise. "You just graduated from high school. How could you have held such high positions in a company? What company?"

"The Oddity Shop," the youth answered. "I helped form the company with seven other boys. We sold shares and raised enough money to set up a workshop and produce wood and plastic novelties. I was a stockholder in the company and also served it as a salesman, bench worker, advertising manager, production manager, and treasurer. The company was a success from

Officer

Business-like Frank Cicciari, who by day shines shoes for a living, is a desk executive at night as the president of The Wood and Metal Arts Co.

Organization

Promotion-minded George Gera helps raise capital to organize by selling shares of stock to the neighborhood barber and other friends.

the start, and is now paying dividends to its stockholders and bonuses to its members!"

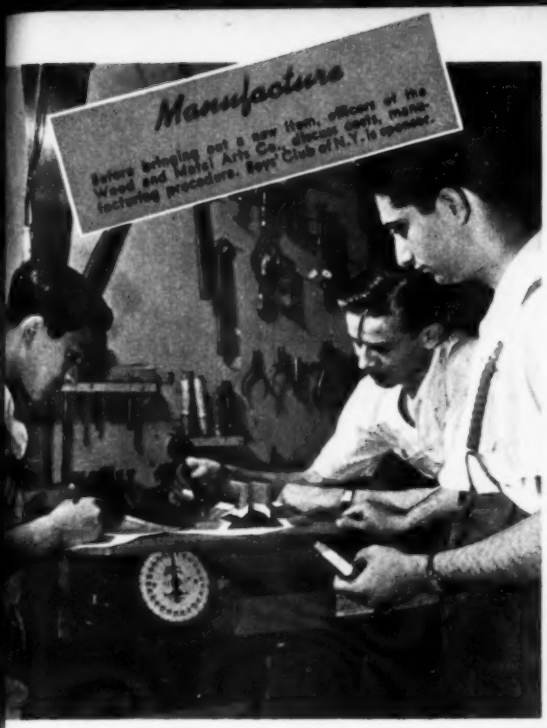
P.S. The boy got the job, and has been advancing steadily ever since because of his thorough understanding of business procedure and obligations.

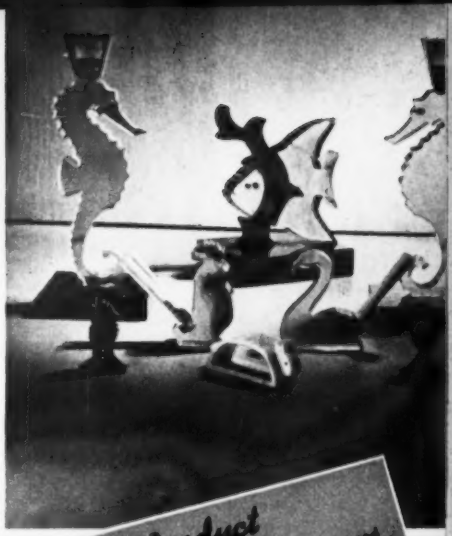
That junior business man is only one of many teen-age Americans, though. Boys and girls still learning their math, trig, and biology in the daytime, are devoting part of their spare time at night to getting an even greater and more practical education in business procedure and the American system of free enterprise. They're not getting this education from books or lectures, either. They're getting it by sound, practical experience; the actual experience of starting a business from scratch, building it up by their own efforts alone, and making a success of it!

It all started back in 1919, when Horace A. Moses, President of the Strathmore Paper Co. of West Springfield, Mass., decided that youth needed a break. Discouraged youngsters at that time were of the opinion that all good business opportunities had been gobbled up and that there was nothing much left for them. With war veterans back in civilian life and the post-war slump beginning, an over supply of labor existed.

Determined to revive the battling spirit of American Youth, Moses conferred with the late Theodore N. Vail, then a top-rank telephone industrialist, and the late Senator Murray A. Crane. Together they worked out a plan of encouraging youngsters to develop their own ideas and abilities, set up workshops in basements, barns, vacant store rooms, attics, or wherever they could find space, and carry through on their own initiative. To back this plan, the three men raised a quarter of a million dollars.

The movement was met with instant enthusiasm. Junior "companies" began springing up all over the city! Backers were elated. The organization began spreading out to other cities and states until today there are more than 110 successful miniature "companies" run by teen-age youngsters in eleven cities


Manufacture
Before bringing out a new item, officers of the Wood and Metal Arts Co., discuss costs, manufacturing procedure. Boys' Club of N.Y. is sponsor.



Product

With metal no longer available, plastic and wood now make most of the fast-selling novelties produced by many of the youth-operated firms.

Sales

Sales set-ups are simple, efficient. Samples, e.g., lapel gadget pins are displayed on girl agents who take orders from friends, and get commissions.

in seven states. As Metropolitan Junior Achievement, Inc., it's still spreading fast under the impetus of war-spurred production.

Although Junior Achievement, Inc. at one time boasted thousands of "companies," these were not in a sense real businesses but merely craft-training programs for children from eight years up. The real movement didn't get under way until two years ago when the leaders, realizing the lack of adequate, practical business training and experience available to youngsters, decided to alter their program and stress the business training angle, leaving the crafts training secondary.

Youngsters from 15 to 21 years of age pitch into the program with great enthusiasm. Patriotic citizens and organizations contribute to the cause by sponsoring the individual "companies," and supplying them with three adult advisors each: a business advisor, a crafts advisor, and a promotional advisor. These three leaders proffer nothing but advice and instruction on correct business procedure. With that, the boys and girls are entirely on their own. The sponsors provide working space at a nominal monthy rental ($2.00 to $5.00 per [*Continued on page* 173]

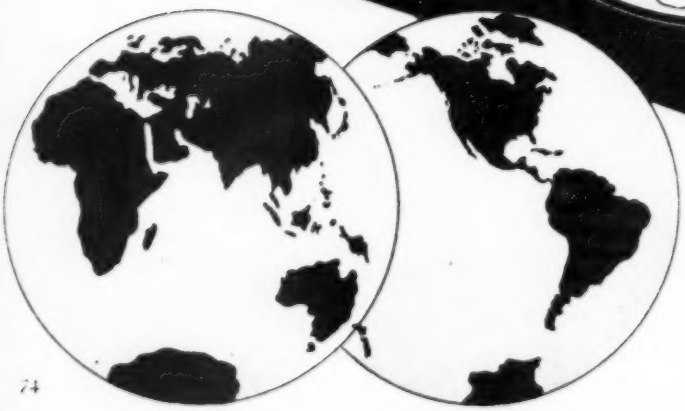
The Secret of Axis Strategy

THAT the Axis plans definitely to dominate the world is known to most people. But the plan they have evolved, have followed and have brought to within some four-fifths of successful completion is realized by few. Yet the outlines of the plan have been plainly drawn by an entire school of German geo-political writers. And those outlines have been followed by every move the Axis has made so far.

I propose to explain here the startlingly simple scheme which explains all Axis strategy.

The groundwork of the plan, strangely enough, was laid by an Englishman, Sir Halford Mackinder, who in 1904 warned his

Nazis started the war by capturing "The Heartland" of their "World Island." But next they seized the European Coastline.

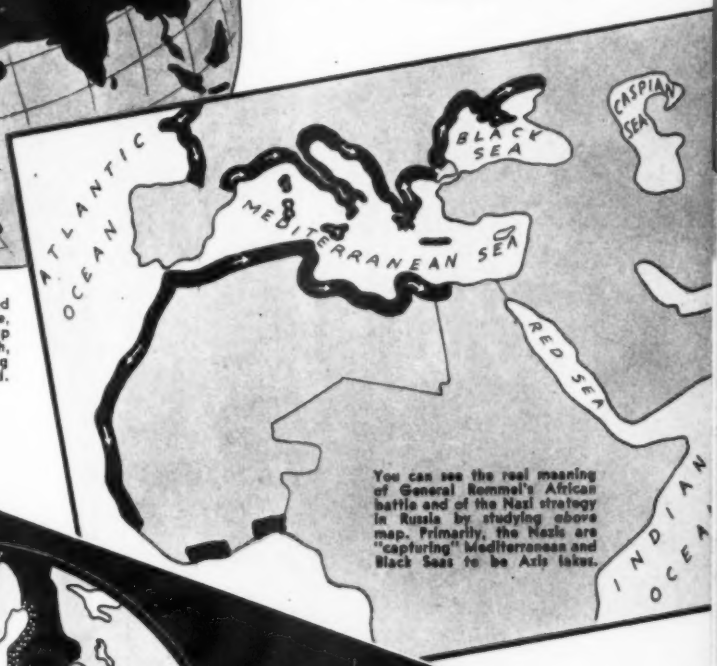


Nine-twelfths of our earth is water, as these spheres show. Prior to this war, control of the seas meant control of the world. But now the Axis has evolved a new strategy of "surrounding" the seas by marching around coastal areas. In four maps above, note how all moves follow the coastlines.

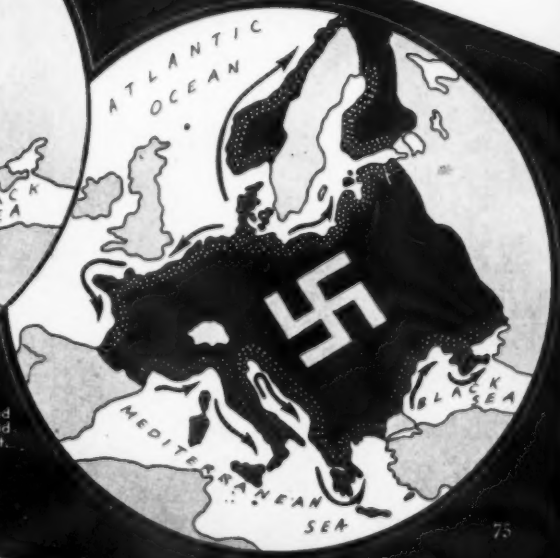
A "March Around The Oceans" is the key to all Axis successes, this expert says.

by Major Malcolm Wheeler-Nicholson

Nazi Geo-Political writers recognized that the "World Island" shown above, of Europe, Asia and Africa, makes up two-thirds of all land areas on earth, and calculated that by controlling coasts they could control the world.



You can see the real meaning of General Rommel's African battle and of the Nazi strategy in Russia by studying above map. Primarily, the Nazis are "capturing" Mediterranean and Black Seas to be Axis lakes.



Watch the dotted white coastlines spread as Nazis continue their "March Around Sea." Every Axis move follows coast.

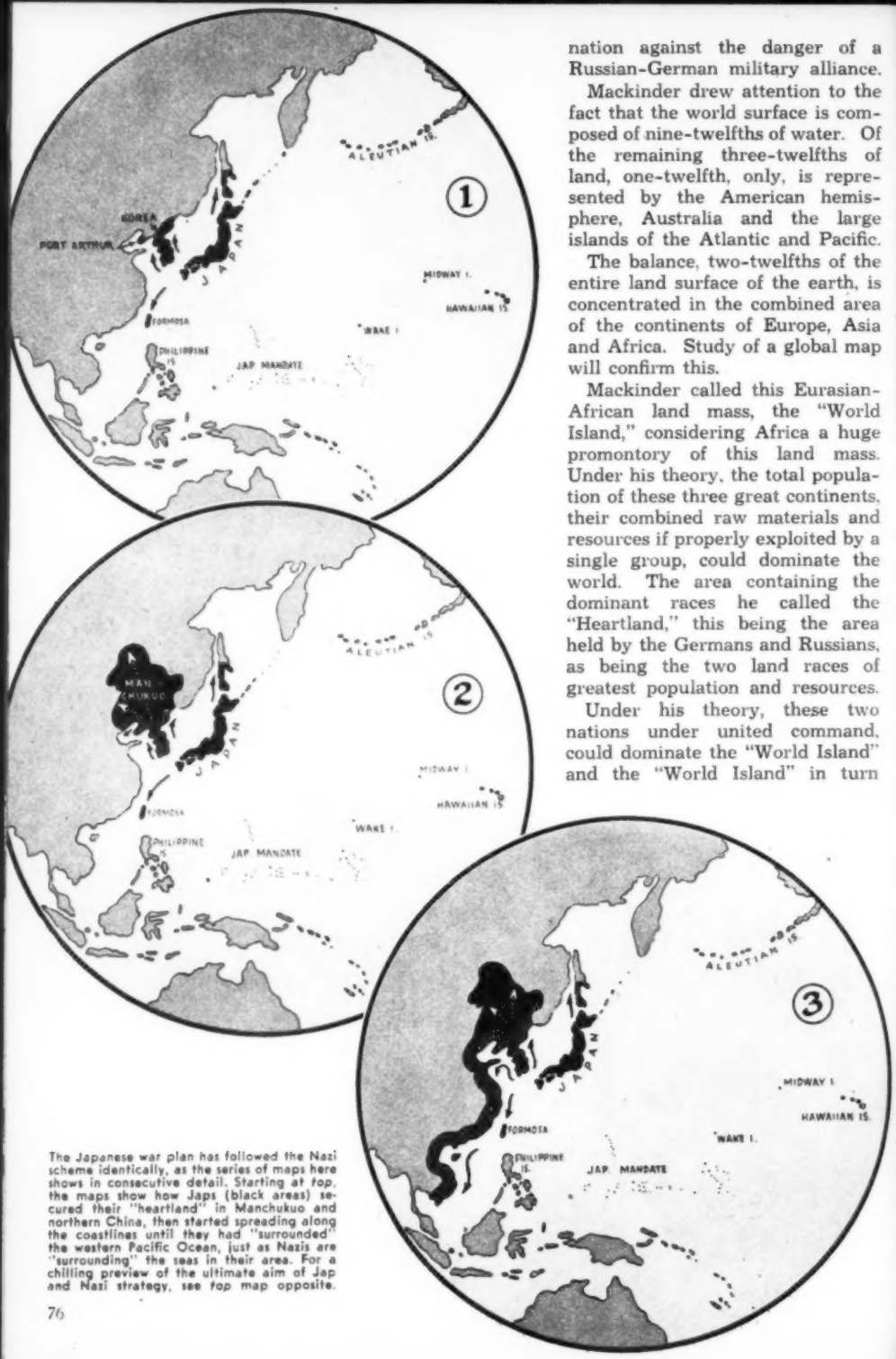
nation against the danger of a Russian-German military alliance.

Mackinder drew attention to the fact that the world surface is composed of nine-twelfths of water. Of the remaining three-twelfths of land, one-twelfth, only, is represented by the American hemisphere, Australia and the large islands of the Atlantic and Pacific.

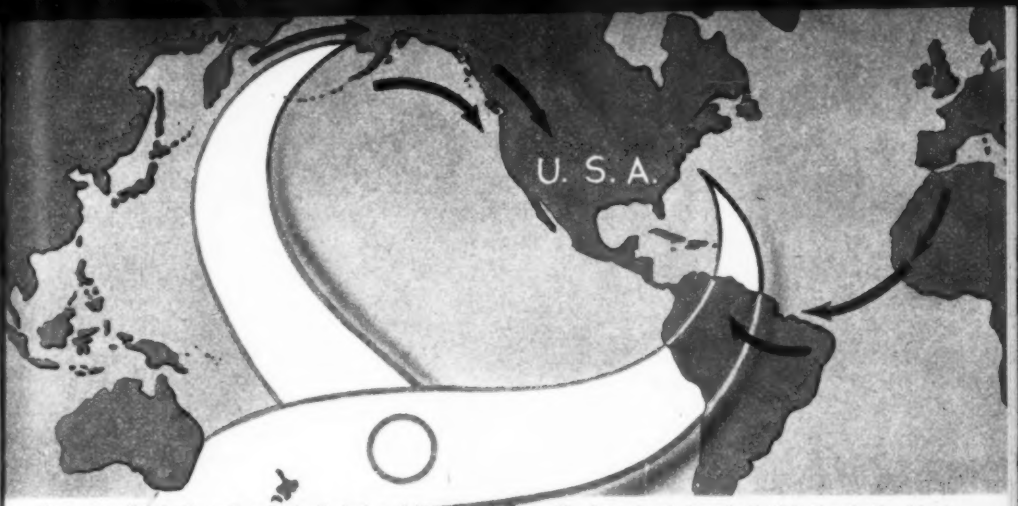
The balance, two-twelfths of the entire land surface of the earth, is concentrated in the combined area of the continents of Europe, Asia and Africa. Study of a global map will confirm this.

Mackinder called this Eurasian-African land mass, the "World Island," considering Africa a huge promontory of this land mass. Under his theory, the total population of these three great continents, their combined raw materials and resources if properly exploited by a single group, could dominate the world. The area containing the dominant races he called the "Heartland," this being the area held by the Germans and Russians, as being the two land races of greatest population and resources.

Under his theory, these two nations under united command, could dominate the "World Island" and the "World Island" in turn



The Japanese war plan has followed the Nazi scheme identically, as the series of maps here shows in consecutive detail. Starting at *top*, the maps show how Japs (black areas) secured their "heartland" in Manchukuo and northern China, then started spreading along the coastlines until they had "surrounded" the western Pacific Ocean, just as Nazis are "surrounding" the seas in their area. For a chilling preview of the ultimate aim of Jap and Nazi strategy, see *top* map opposite.



Here, according to the author, is the final plan of Nazi-Jap strategy. The Japs already have foothold in the Aleutian Islands off Alaska. The Nazis already have seized the coasts of Africa at Dakar. Joint moves will "pincer" us at our extreme defenses.

could dominate the rest of the one-twelfth of the land surface of the world in which the Americas and Australia and the islands of the sea were considered simply as satellite and relatively unimportant appendages.

The Germans, who since 1894, have maintained a body of scientists now known as the Geo-Political Institute who devote their studies to the problem of making Germany the dominant power in the world, seized upon this theory. Unsuccessful effort was made in the war of 1914-18 to secure this domination by opposing British naval power by German sea power, only to meet failure because the two great Anglo-Saxon powers, Britain and America, combined their naval power and successfully resisted the German onslaught.

The indefatigable Geo-Political Institute then set about cooking up another scheme. This, in essence, was a study of the best means by which *land power could overcome sea power.*

It occurred to the Germans that sea power was absolutely dependent upon bases, a fact known to everyone. But the Germans went a step further. *If the bases, they reasoned, could be destroyed from the land side, sea power could be overcome.*

This conclusion led the Germans to their final plan. This plan was to overcome British sea power by German land power, by the simple expedient of *"marching around the oceans!"* It is important to keep this phrase, "marching around the oceans," in mind as we proceed.

The plan was sound as far as it went.

But even at this stage it lacked something to make it certain of success. That something was supplied by an American.

In the early 1920's General William Mitchell announced his theory of the superiority of airplanes over battleships. He was bitterly condemned by his own [*Continued on page* 176]

You're RIGHT — That's WRONG

Here are 25 statements, some of them true, the others false. The trick is to separate the *true* statements from the *false* ones—and it isn't as easy as it looks! Use a pen or pencil and check the correct box under each statement and see how you make out! After you've given yourself the test, try it out on friends and other members of the family and compare scores. They'll enjoy it and so will you.

Are you ready? Let's go!

1. The avocado is one of the most vicious of all long-toothed mammals in the Western hemisphere.
   True ☐ False ☐

2. The Beaufort Scale is not employed in writing music for modern stringed instruments.
   True ☐ False ☐

3. In the bitter cold regions of the far North it is customary for the inhabitants to wear cotton-mouthed water moccasins on rainy days.
   True ☐ False ☐

4. Modern airplanes have succeeded in flying into the troposphere.
   True ☐ False ☐

5. One ounce of gold can be drawn into one and a half miles of wire.
   True ☐ False ☐

6. The Hudson River once flowed through what is now Philadelphia.
   True ☐ False ☐

7. Carrots are the only food containing carotene, which the human body changes to vitamin A.
   True ☐ False ☐

8. Spot welding is the term applied to heavy emergency welds made on the spot where damage occurs, without bringing the job to the welding shop.
   True ☐ False ☐

9. Kilowatts turned out by small household generators are usually less than 500 watts, while those produced by large dynamos are always more than 1,000 watts.
   True ☐ False ☐

10. A microtome is an instrument for cutting tissue into thin sections for microscopic examination.
    True ☐ False ☐

11. Radishes are not all as small as the ones that grace your dining table, as Chinese radishes may weigh as much as 10 pounds.
    True ☐ False ☐

12. It is impossible for an eclipse of the sun to last longer than seven minutes.
    True ☐ False ☐

13. Although you may envy birds on a hot day, they have higher body temperature than other living organisms.
    True ☐ False ☐

14. A pear slug is a soft lead bullet, shaped like a pear, and designed to spatter on contact with the target.
    True ☐ False ☐

15. Limburger cheese is made from sour skimmed milk only, as sweet milk would contain too much oil.
    True ☐ False ☐

16. Eighty per cent of the iron in the human body is in the blood.
    True ☐ False ☐

17. No apple tree has ever been known to bear fruit for more than five years.
    True ☐ False ☐

18. An independent chuck is so named because it operates independently, and is never actually attached to the lathe, usually being fastened to the wall nearby.
    True ☐ False ☐

19. If the cutter of a lathe is moved one quarter of an inch into the work, it will cut one half inch from the diameter of the article being turned.
    True ☐ False ☐

20. A Spinnaker is a large, harmless, web-spinning spider generally found on board ship.
    True ☐ False ☐

21. Famous "stern wheelers" of the Mississippi got their name from the strict and stern attitude of their skippers.
    True ☐ False ☐

22. Cows must be trained to back away from electric "shock" fences—they have a tendency to jump through the fences.
    True ☐ False ☐

23. Ball bearings have been made as small as four hundredths of an inch in diameter.
    True ☐ False ☐

24. Exposive shells are commonly loaded with TNT by heating the TNT until it melts, and then pouring it into the shells.
    True ☐ False ☐

25. In photographic terms, a compound lens is a simple lens that is made of a compound or plastic instead of glass.
    True ☐ False ☐

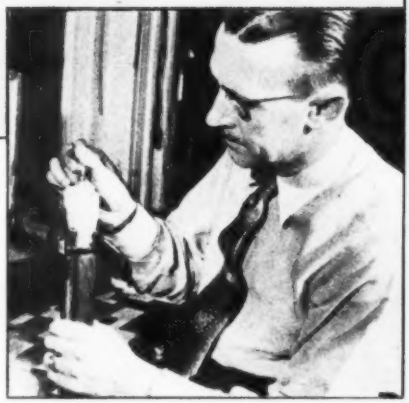
WHAT'S YOUR SCORE?

To get your score simply give yourself 4 points for every question you answer correctly and total the result. If your mark is above 90, you are exceptional; if it is between 80 and 90, you deserve high praise; if it's between 70 and 80, you're good; between 60 and 70, fair; and below 60—well, try again next month!

Answers will be found on page 153

NEWS OF SCIENCE AND MECHANICS

DRY ICE FIRES GUN
SALVAGERS PROFIT
HOW TO LEAD BAND
PLANE X-RAY LAB

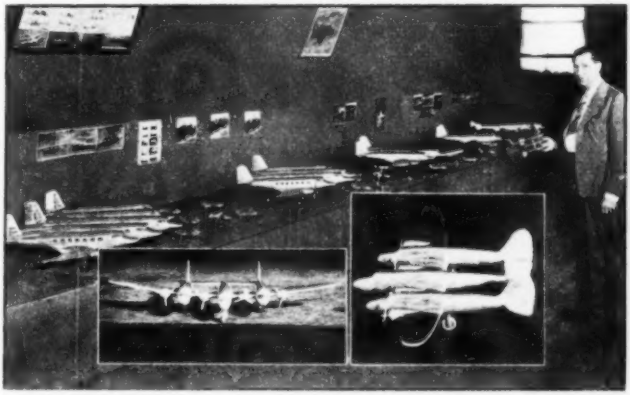


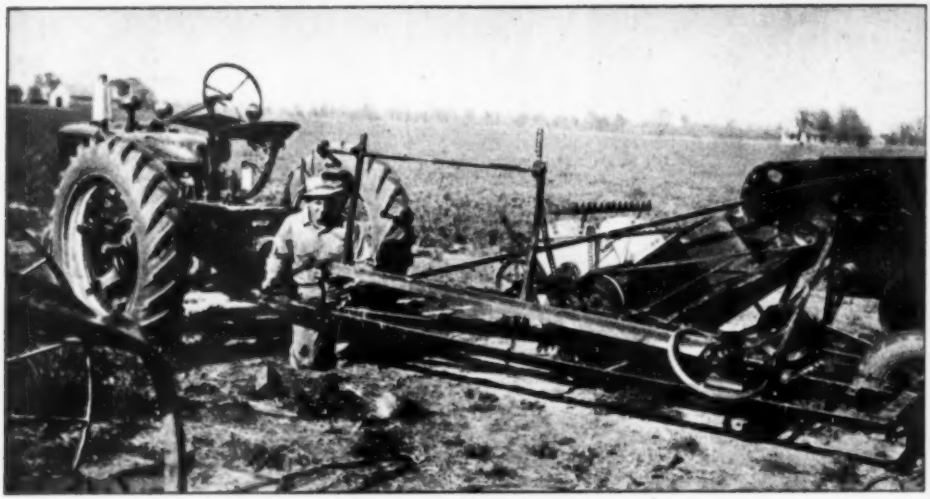
Dry Ice Fires Target Gun

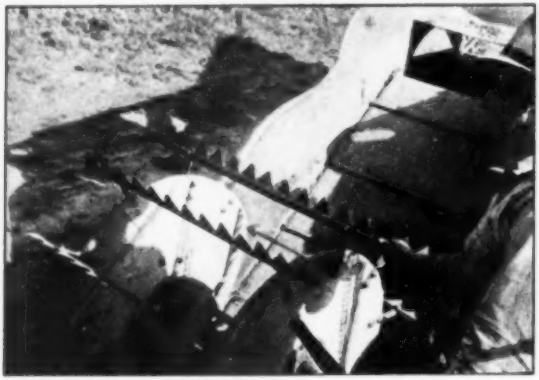
THIS gun invented by Ray Monner of Denver uses no powder, doesn't need cartridges, and fires a thousand times at a penny's cost. Its power comes from dry ice, shown at right being scooped into a magazine paralleling barrel. There it liquefies, is valved into a chamber behind the projectile, the amount governing the firing power. It can fire bullets gently—or through a 3" plank!

Multi-Fuselage Planes Proposed

LONG-RANGE transport and bomber planes can be realized by extending the dual-fuselage principle. Leo Oliver (right) of Sanger, Calif., believes. Inset: an Oliver tri-fuselage scale model. In the large photo are four- and five-fuselage examples. Extra fuselages mean reinforced, larger-surface wings.







Popeye In Mind, Growers Of Spinach Invent Harvester

THE U. S. Army, which buys all spinach raised by T. R. Stone and his son Ralph of Muskogee, Okla., thinks as much of the vegetable as Popeye. Determined soldiers would get their iron despite labor shortages, the Stones used an old combine to make the first spinach harvester. Large-teethed blades were put on the reel (left) spaced so they rotate and hold the spinach against a cutter. Conveyor elevates, drops the crop.

Helping Service Wives Make A 'Boxy' Home

DESIGNED to aid the wives of service men frequently transferred, the compact chest at left in the photo opens to form two secretaries like that at right, and also contains the two lamp tables and cocktail table shown. Of enameled gumwood, the set contains no vital materials. Introduced at the same time were slip-covered folding chairs of canvas and wood which fold compactly as camp chairs for stowing.

Beachcombing Is Profitable

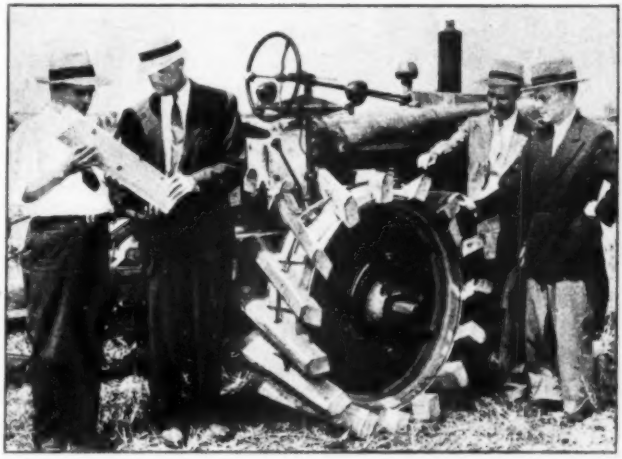
CAPE CODDERS brag "We can't lose" as they salvage the washed-up cargoes of freighters wrecked or torpedoed offshore. Here amateur beachcombers retrieve drums of oil, theirs for only the tariff if the owner doesn't pay them two-thirds of its value.

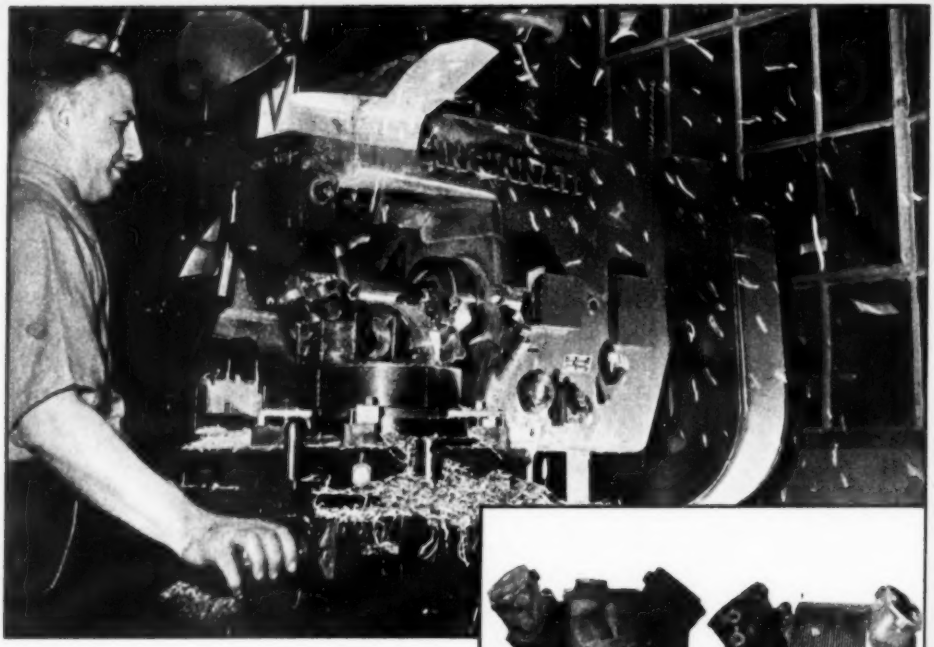
An Admiral Aged 13

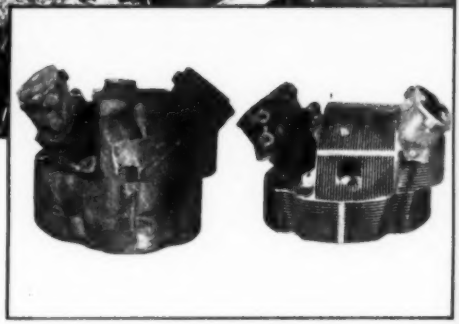
JOSEPH BASHORE, 13, of Wyandotte, Mich., made 50 model planes for pilot-training use by the Navy, which gave him the title of Admiral Aircraftsman. The model Joe holds is the largest he's ever built.

Tractor "Tires" Now, Stove Fuel Later

TO REPLACE the mammoth tires on farm tractors, Kansas OPA has approved these wooden lugs for temporary use through the harvest season, after a test near Wichita. The substitute was devised by James Landers (second from left), OPA tire-rationer, to cut down rubber use, without harming farm output. After the emergency, these lugs will make good stove chunks!





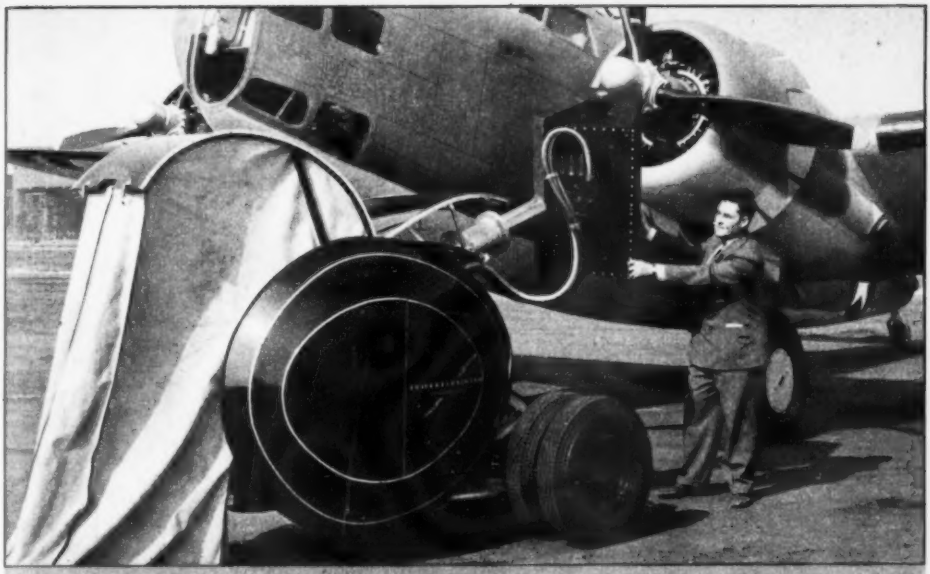


More Power For Our Planes

DEVELOPMENT of a forged cylinder head and methods for producing it speedily is being termed an historic aviation step, since the head increases plane engines' horsepower 12% to 15%, realizes the dream of a high output plane engine weighing less than 1 lb. per h.p. It's twice as strong as a cast head, permits better cooling (since fins are deeper and forged metal conducts heat 35% better), cuts fuel use, saves many manufacturing hours because 95% of forgings (left in small photo) become machined cylinder heads (right) while only 80% of cast heads make the grade. A revolutionary milling machine (large photo) was built to Wright Aeronautical Corporation's specifications for cutting the fins.

No Need To Turn These In

YOU won't have to turn in one of these tubes when you buy a new supply of toothpaste. They're not made of tin, lead, or other vital metals but of plasticized cellulose. Made in various sizes and colors, the tube is seamless, rolls from the bottom. Shown here with a giant sample tube is its inventor, Harry Waters of N.Y.C. It probably will survive war-induced use since tests show it superior in many respects to metal tubes.



Trailer X-Ray Diagnoses Plane's Ills

FIFTEEN minutes after a warplane lands, this X-ray trailer-lab can produce a complete diagnosis of the plane's possible invisible structural weakness. Top, a Lockheed Hudson bomber's prop is X-rayed to see if the plane can go out again or needs repairs. Left, before going to work; center, the trailer has its own darkroom; right, X-ray proof of damage is pointed out to an inspector. Crew and craft may have been saved.

Pancake Plane Makes Test Hops

THIS pancake-shaped plane designed by Cheston L. Eshelman took to the air in brief test hops recently at Baltimore, Md. Eshelman, who landed in the Atlantic in 1939 on what he characterized was a "flight to Mars," says it can do 190 m.p.h. and is "the coming thing."

So You Want To Lead a Band?

IT'S a rare man who's not secretly convinced he could step before an 80-piece orchestra and direct it as well as the arm-swingers who, he thinks, make inordinate fuss about it. Actually, conducting is the most complicated job in a highly skilled field. The leader must perform competently on at least one instrument and know all the others in the band. Like a military officer he must command his men's respect for his ability and judgment so they will play their best. His technique must be lucid so that he can communicate to the players the effects he wants.

Here a student at the Julliard School of Music, New York City, demonstrates the commonest gestures: 1. *diminuendo,* play more softly; 2. *attention,* on the alert, ready for the sweep of hand that starts the piece; 3. *emphasizing the beat,* vigorously moving the left hand in tempo will bring in players who have strayed from it; 4. *crescendo,* play more loudly; 5. *cueing,* to bring in a section of the band previously silent; 6. *cut-off,* all instruments cease playing. as at the end of a held note. or of a number. Left, a conducting student practices technique before a mirror.

NEWS OF MODERN WARFARE

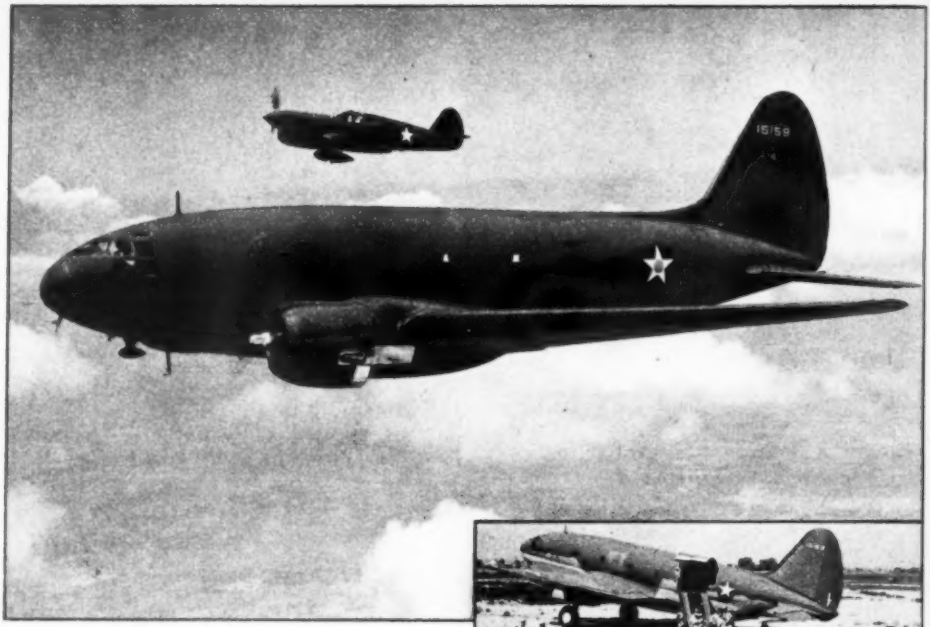
Now The Foot-Weary Infantry Restfully Glides

INFANTRYMEN are still foot-soldiers, all right, but now seldom march to their place of ground combat. The energy so expended is saved for the fighting wherever possible by carrying the infantry in vehicles, from trucks to jeeps—and in the newest transports of all, gliders like this CG-3. It takes off on wheels, which it drops to land on wood skids.

Silent, inexpensive craft like this nine-place, dual-control glider are among the airships vital to establishment of a second front in Europe, observers feel. Here the eight members of an infantry squad stand by at Wright Field, O., ready to climb aboard.

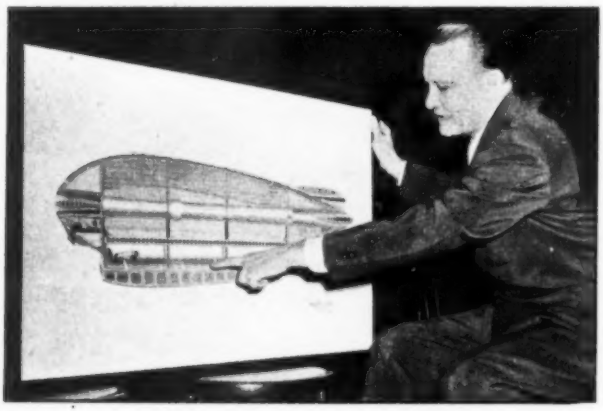
Air-Gunner Roosts In A Belly Bubble

TO AN army air gunner a belly bubble refers less often to a digestive disturbance than to this highly uncomfortable, dangerous, but effective firing perch on the underside of a Flying Fortress. The gunner curls up inside, in combat is often somersaulting while shooting a .50-caliber gun between his feet! Also called a 'duster,' the belly bubble revolves in any direction to protect the ship from adversaries approaching from below.



C-46 Takes On A Column

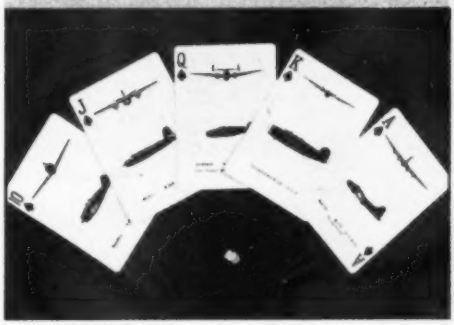
LINED up in a column ready to climb aboard are the tons of troops and supplies—including three jeeps—which will make the U. S. Army's new transport plane, the Curtiss C-46, weigh 50,000 pounds when loaded. Yet it's fast as a combat plane (a prototype flew the Atlantic non-stop in less than 9 hours), but large flap area enables it to land in small fields and slower than pursuits. Named the Commando, it's paced by a new P40F "Warhawk" fighter above.



Gas Would Lift Cargo Plane, Suction-Driven

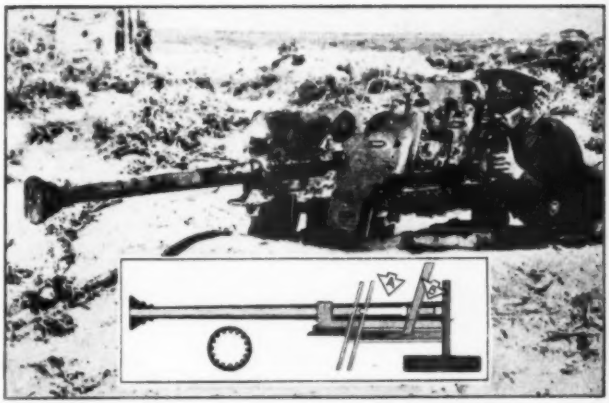
SENATOR JOSH LEE studies a gas-lifted cargo plane which would be suction-driven. The design was submitted to the Senator's military sub-committee to solve the transport problem. Twelve fighter planes could take off from the flying deck. It seems to combine the features of a dirigible, a jet-propelled plane, and carrier.

Playing Cards With Planes



YOU can learn to identify the aircraft of the United Nations and the Axis while playing cards, if you use the new ones originated by Sgt. Walter Gross of the Third Air Force, Tampa. The silhouettes of the planes replace the four suits, so that use of the cards impresses distinctive features of them on the mind unconsciously. U. S. planes are on the spades, British on the hearts, Japs on the clubs, and Germans on the diamonds.

Captive Nazi Gun Squeezes Out Bullets



CONCEDED best of all today's anti-tank gun is the German Guerlich whose shell (A) half jams in the tapered barrel (see cross-section) so that expanding gases (B) blow it out at a rate of 4,750 ft. per second. The 28-mm. shell reduces to 20-mm. in the barrel. British officer is here shown with a Guerlich captured in Egypt.

Knapsack-Apron Kit

AN AMERICAN nurse has devised this portable first-aid kit for doctors' and ambulance workers' use during air raids. Weighing only 4-6 lbs., compact, waterproof, it can be worn on the back to the scene, then turned and opened like an apron, leaving the wearer's hands free even when kneeling. Each kit has more than 30 items, enough sterile equipment for emergency surgery.

Hog-Callers Not Needed

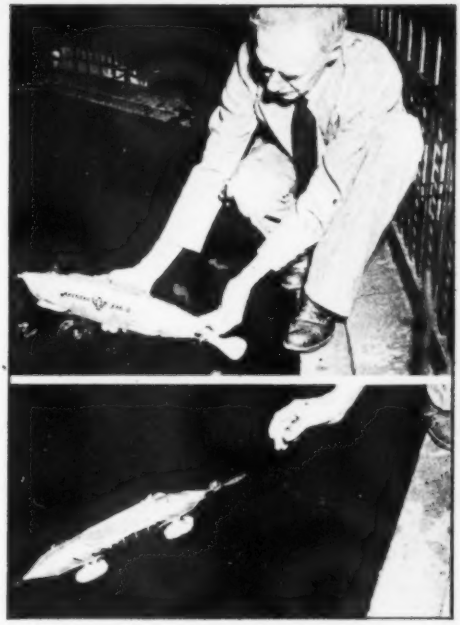
AXIS soldiers don't need to be hog-callers, fortunately, in order to have Blind Pig (above) come running toward them. It's actually a radio-controlled bomb developed in the laboratory of Larry Crosby, shown, brother of Bing, in Pasadena, Calif. Radio-directed, the bomb would wheel toward enemy men, tanks, etc., rapidly, burst when objectives are reached.

Pimple-Nosed Flying Boat Is Tops In Range

AQUATIC cousin to the Flying Fortress bomber is the new Sea Ranger, XPBB-1, Navy's new long-range flying boat. An entirely new type of naval aircraft, it has but two engines but is in the weight class of four-engined planes. It's expected to have a longer range, greater bomb load than any present naval plane. Its defensive armament is heavy.

Winnie Gives Ear

DURING his recent look-see in America, Prime Minister Winston Churchill of Great Britain tried out a ground unit of a plane-to-field radio during a surprise visit to Fort Jackson, S. C. The compact, portable unit with antenna has a phone-like mouthpiece and earphone. Here he's hearing orders given paratroopers as he perhaps envisions their part in an invasion of Europe.

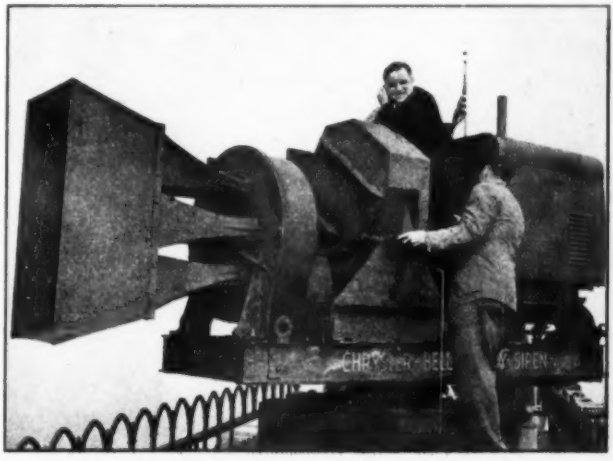


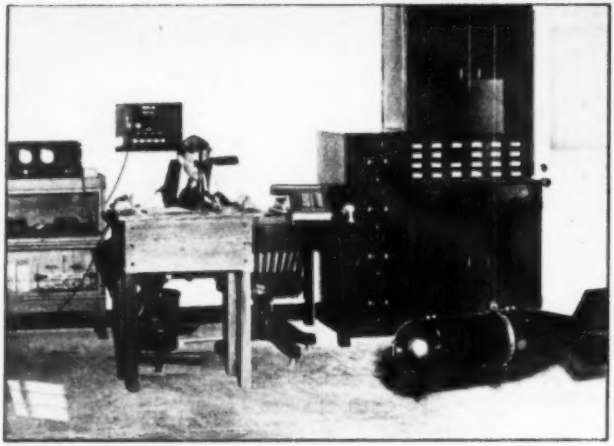
Sub-Like Surface Ship

P. M. WILLIAMS of Columbus, Ga., invented this model of a new-type surface ship having some of a sub's advantages. More maneuverable than ordinary vessels, it could submerge when an enemy craft comes in sight. Fins would prevent its remaining turned over, and special watertight compartments would save crew and cause craft, if torpedoed, to surface again, Mr. Williams claims.

Butch's Eardrums Hurt As He Tests NYC Siren

LONG anxious for a siren loud enough to be heard in all its five boroughs, New York City uttered an official yelp of relief when its ears were struck by the wail of this huge air-raid siren just installed atop a midtown skyscraper. Costing $5,500, heard for five miles, the eerie wail is said to be capable of fracturing any eardrum within 200-ft.—even the mayor's!



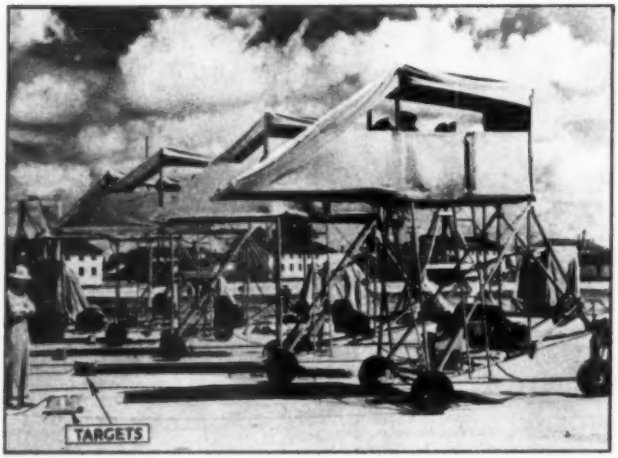


He's the Emily Post Of Bomb Behavior

SO THAT U. S. bombers can lay their "eggs" right where they'll do the most good, this scientist—ballistician at the Aberdeen, Md., proving ground—studies this real bomb to find out how it behaves in flight. As it swings gently, the tension on the wire is measured. The result—pay attention, now—is the transverse moment of inertia of a bomb, the ballistician says.

Small-Weapon Trainees Practice on Toy Towns

TINY villages help small-weapon trainees at Camp Robinson, Ark., learn target designation and range estimation in a jiffy. Markers designate various ranges to help estimate mortar fire. Small amounts of chemical dropped in the village give the impression of a bomb being exploded. Seen from the firing line, the village looks just the same as its full-scale counterpart would at 700 yards.

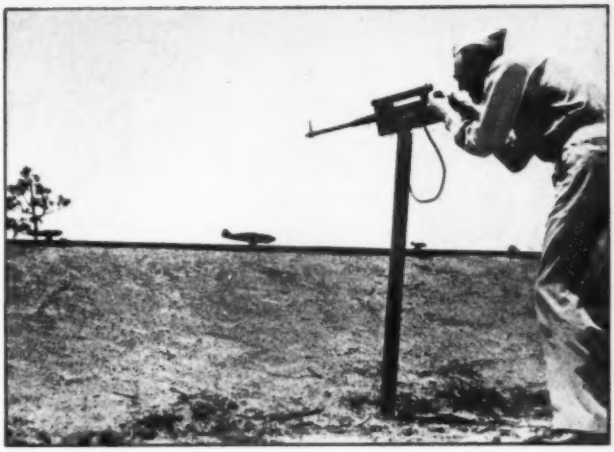


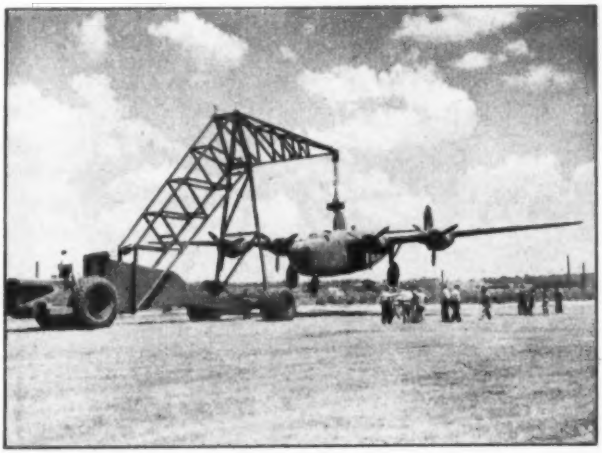
Bombardiers-to-be Ride Wheeled Stilts

U. S. ARMY air corps members learning to become bombardiers get into these rough replicas of a plane fuselage which are mounted on "wheeled stilts." They are maneuvered on the concrete while the little targets are also moved. The crew in the trainer "fly" by instrument to bomb the boxes. The trainees, trying to score a bull's-eye, call it the game of hit-the-bug.

Shooting Gallery for Air Gunners Uses BB's

ARMY air force gunners at Tyndall Field, Fla., don't go to a shooting gallery off duty—they get that sort of practice on duty, free! Here's one firing a BB machine-gun operated by compressed air, at a line of small planes moving across the range. Three sizes of planes are used (biggest is 15 inches long) to represent enemy planes at 200, 400, and 600 yards distance, respectively.





Mama of all Cranes Lifts B-24 like Baby

MAMA of all airport cranes, at least, is this mammoth mobile crane recently demonstrated at Patterson Field, Ohio. It can quickly clear runways of planes wrecked by accident or war attack, thus preventing possible delay of the take-off of others. Here swinging a B-24 bomber off the ground, the crane handles the heavy bomber tenderly as a babe. The crane is 39 feet high and the front tires are 8 ft. across.

Rommel Vehicle is Half Motorcycle, Half Tank

ONE of the pieces of equipment captured by the British in Libya-Egypt fighting was this unusual vehicle, apparently a cross between a motorcycle and a tank. It has the maneuverability of the former, due to its single front wheel and handle-bars, and the half-tracked ruggedness of a tank, plus two wheels of a truck. Rommel's men used it to carry a few men or tow small guns rapidly.

Class-Size Compass

TEACHING each soldier individually how to sight his small lensatic compass would take more time in the training schedule than sensible, the staff at Camp Joseph T. Robinson in Arkansas thought. So they built a scale compass of wood, 25 times larger than life, to teach a whole class at once.

Bottling Up Gas Defense

NAVY AIR COMMANDER N. A. DRAIM, Norfolk, invented this gas-defense gear that strains poison air through a lime-charcoal mix in a stoppered milk bottle. A felt filters the air, too. A valve disposes of exhaled CO_2. Gassed, the user must hold his nose and breathe through his mouth.

PT Boat's Gunner Nestles In Eyecup

THE specially-designed, protective gun turret on the bounding, tarpon-swift patrol-torpedo boats is shaped like an eyecup to keep the eager gunner's fire altogether on the enemy, unable by any mischance to shoot any part of his own craft with the 50-caliber gun. Primarily an attacker, the PT boat, nevertheless, can give a good account of itself defensively with this effective gun.

PROCESSED PORTRAITS

by Serge Balkin

FIG. 1 *(above)*: The straight portrait whose original negative was used for the accompanying novel presentations. FIG. 2 *(below)*: An ultra modern effect described in the text.

EVER tire of looking at the same old portrait day after day and wish there were something you could do to revive your interest in it? Even though the portrait may be one of your masterpieces, you can't help tiring of it eventually and pushing it into the background in favor of more recent studies.

There is no reason why you shouldn't be able to pep up the original portrait by varying its presentation. With a pair of scissors, pen and ink, and an assortment of photographic props, you can either modernize or antiquate it, frame it, or turn it into a beautiful pen and ink sketch.

Figure 1, for instance, is a simple portrait of a pretty girl, printed straight from the original negative. Compare it with the five other

FIG. 3 *(below)*: Paste-up of the head with a tapestry design.

FIG. 4: An antique enamel effect—pen and ink were used.

accompanying illustrations, which present the same portrait in as many different and unusual ways. You can do these tricks and many others with any of your own portraits, and thereby, not only revive interest in them, but possibly improve them as well.

The procedure is simple. Figure 3, for example, was produced by simply cutting out the girl's head and shoulders and pasting the cut-out on a photograph of a tapestry design. The paste-up was then copied on process film, producing a negative from which the finished print was made.

If you have a leaning toward art and freehand drawing, you can turn your portrait into a fine pen and ink sketch with delicate intermediate tones, and you don't have to be a skilled artist to do it. Just make an underexposed print of your portrait negative and develop it until the image resembles a high key portrait. When dry, take pen and India ink (preferably black), and trace around the denser portions of the subject's outlines to stress the contours of the face and hair. Don't trace the entire portrait, as this would only kill the effect of the delicate half tones in the photograph. Just accent the important features, to give contrast to the middle tones, and you will have an artistic result similar in appearance to Figure 5.

Another interesting pen and ink presentation, whereby the portrait is turned into an "Antique Enamel," is shown in Figure 4. Here, the portrait was cut out and pasted on a photograph of a genuine Byzantine painting, after which it was inked over with bold, energetic strokes to simulate ancient oriental art.

If you want to present your picture in an ornate frame, as in Figure 6, make a photograph of such a frame, cut it out, and paste it over the portrait. A more distinct effect can be produced if the portrait is printed at an angle and all but the features burnt out. This will [*Continued on page* 171]

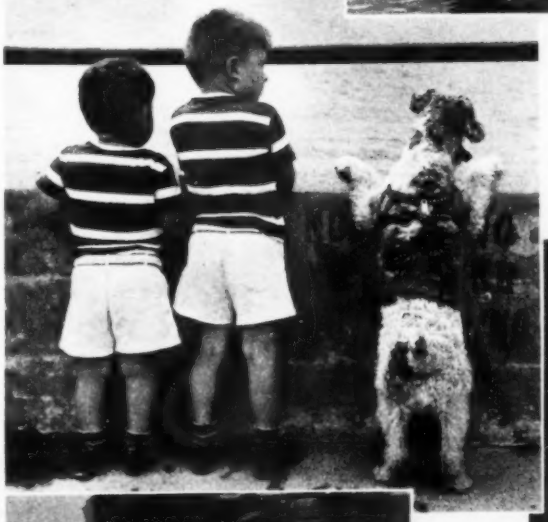
FIG. 5 *(below)*: The textures are photographic, but the bold outline accents were done with pen and ink. FIG. 6 *(right)*: This framing was done by the cut-out and paste-up method

PHOTO CONTEST

FIRST PRIZE ($10.00): "Hauling the Nets" by Paul Hadley, Piggott, Ark. Taken with a 5 x 7 view camera on Superpan Press film; f/22, 1/100th second, at sunset. SECOND PRIZE ($5.00): "Soapy" by Ed Arnold, 9 Winchester Place, Burlingame, Calif. Taken with an Argoflex camera on Superpan Press film, developed in DK-20: f/6.3, 1/50th second—2, No. 1 floods. THIRD PRIZE ($4.00): By Jack Garber, 308 East 5th Street, Brooklyn, N. Y. Taken with a Rolleiflex camera, on Superpan Supreme film; f/5.6, 1/100th second. FOURTH PRIZE: By William R. Jacobs, Cumberland Circle, Donelson, Tenn.

Submit prints for this month's contest unmounted—no larger than 8 x 10 inches. With each print list your camera, film, lens opening and shutter speed, illumination, and developer. Write your full NAME and ADDRESS on the back of each print and wrap securely with cardboard or corrugated stiffeners. If you want unused prints returned, you must enclose return postage. (Published prints cannot be returned. Address: Photography Editor, MECHANIX ILLUSTRATED, 1501 Broadway, New York, N. Y.

1st PRIZE



3rd PRIZE

2nd PRIZE

4th PRIZE

LUMINOUS DARKROOM TIMER

by Kenneth Murray

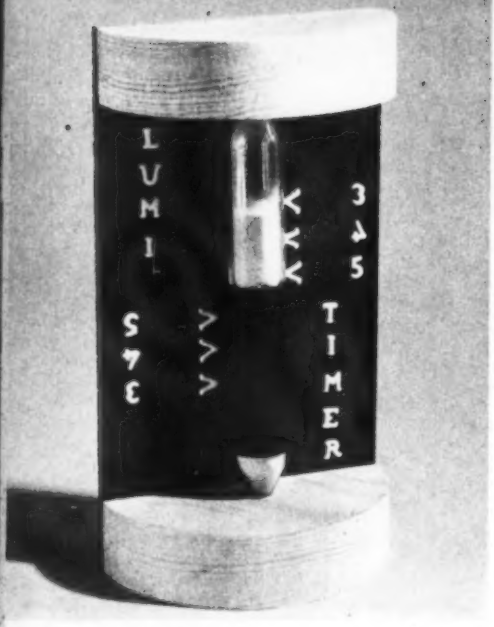
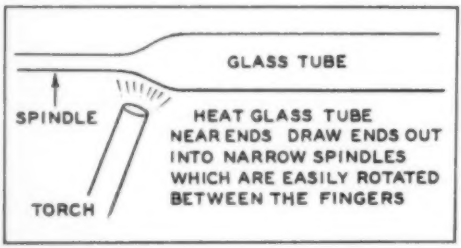


FIG. 1 *(above)*: The black metal sleeve of the Lumi-Timer is set at the 3-, 4-, or 5-minute mark; when the luminosity disappears the sand has dropped behind the jacket—time is up!


GLASS TUBE
SPINDLE
HEAT GLASS TUBE NEAR ENDS DRAW ENDS OUT INTO NARROW SPINDLES WHICH ARE EASILY ROTATED BETWEEN THE FINGERS
TORCH

TRAY developing of panchromatic film, and similar darkroom operations, can be timed accurately with luminous sand.

While clock timers which can be set in the dark are obtainable, a luminous sand timer has the advantage of cheapness, simplicity, and most of all, extreme novelty. This new gadget is fun to make, and, in your darkroom, it will provide a surprise to friends who believe that they are aware of all that is new in darkroom equipment.

The luminous sand timer operates like an hour glass or a three-minute egg timer, except that it can be adjusted for any time up to five minutes—and the sand shines in the dark. Several models will be suggested.

The one which has been given the name of "Lumi-Timer" (Figure 1) is "set" by covering a part of the glass with a movable metal sleeve. In the dark, the sand glows at a bright spot, easily visible, yet not harmful to fast films. When the bright spot disappears (this happens when the level of the sand drops behind the sleeve) you instantly know that the three, four or five minutes is up. There is no guesswork and no confusion. The light

FIG. 2 *(above)*: Melting the middle of a glass tube to make a narrow passage for the sand. Draw end spindles as in diagram.

FIG. 3 *(right)*: The tube's middle can also be melted down by rolling it on asbestos while heating the center with a torch flame.

FIG. 4 *(above)*: After the spindle has been filed and split off, close off the open end of the tube by melting it in the flame as shown. Close off other end after adding the luminous sand.

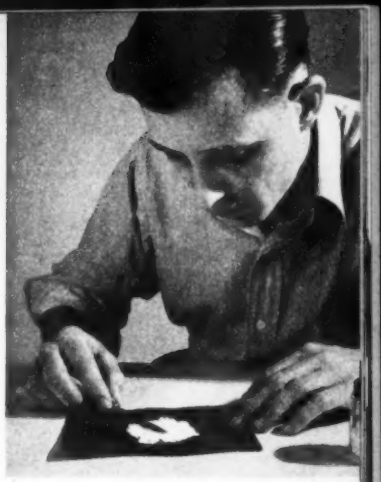


FIG. 5 *(right)*: Luminous powder must be mixed with the sand before the mixture is added to the open end of the tube. All the lumps in the powder must be smoothed out as demonstrated.

goes out and the time is up. You can buy a 10c sand glass and revamp it for the purpose, or you can take an easy lesson in glass blowing, which is fun, and make the entire Lumi-Timer yourself.

Soft glass tubing can be obtained from a drug store, from a school science laboratory, or from a laboratory supply house. Or else, you might secure a piece of tubing from a neon sign that has been broken, or you might even use a glass test tube, costing 5c at 'most any drug store. The tubing used in making the Lumi-Timer was of the neon sign variety, about $\frac{9}{16}$ inch in diameter. The exact size is not important. Free running sand is available to anyone having access to a lake beach. You can also get it from one or two of the cheap egg timers sold in department stores. A hot flame will be required for melting the glass; a Bunsen burner, particularly with a fish-tail burner attachment, is best. An ordinary alcohol or gasoline torch will do very well, however. Since the gasoline torch may discolor some types of glass the alcohol type is the better of the two.

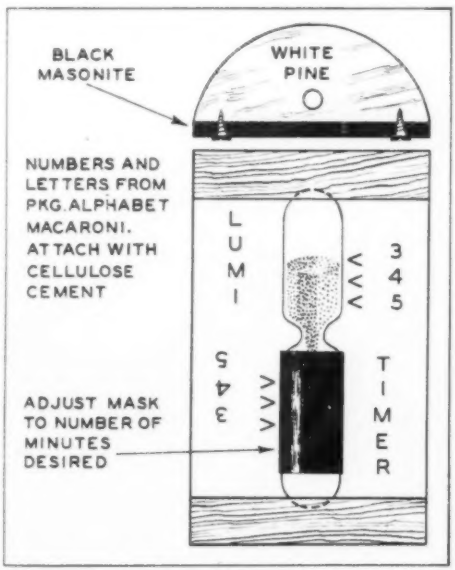
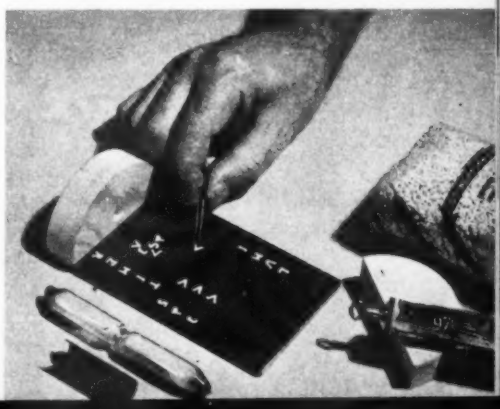


FIG. 6 *(right)*: The glass-holder and timer stand is made of wood and Masonite; letters and numerals, alphabet macaroni attached with cellulose cement—details are outlined above.

The middle of the tube must be melted until the glass thickens and the opening is reduced to about the size of a large needle. To do this successfully, the tube must be rotated continually while in the flame (Figure 2). For this reason, the ends of the tube must be drawn out into narrow spindles which can easily be twirled with the fingers. Merely heat the ends of the tube, which may be 6 or 8 inches long, and draw them out as soon as the glass softens. Melting down the middle of the tube will require a few minutes. Keep the tube rotating evenly in the flame so that



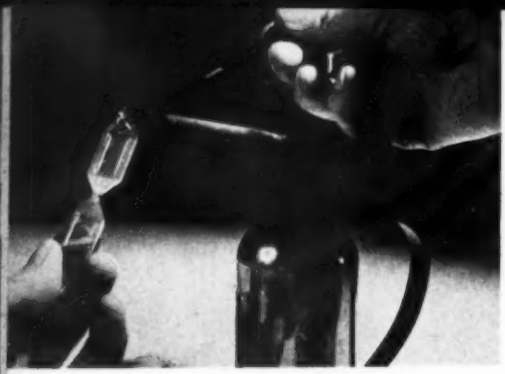


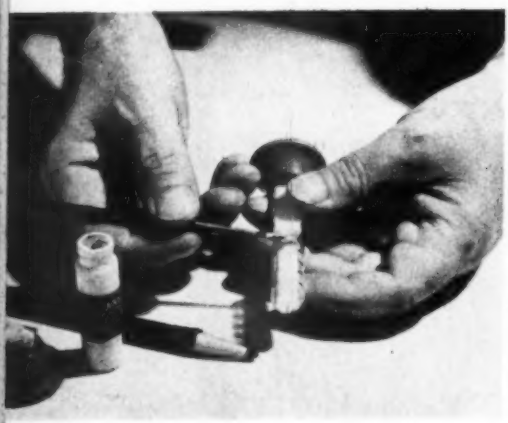
FIG. 7 *(left)*: A timer can also be made from a 3-minute egg timer by opening one of its ends and adding enough luminous powder to make the mixture glow, and still run freely.

all sides will receive an equal amount of heat. The glass will thicken very gradually and when the hole seems to be small enough, you can allow the tube to cool and then test it with a little of the sand. If the sand runs through very fast the hole must be made smaller. The tubing on each side of the hole must hold enough sand for five minutes of running time, with room to spare.

A simpler but more amateurish way of melting down the middle of the tube is to lay it on a sheet of asbestos, raising and lowering one end of the latter (as in Figure 3) so that the tube rolls continually while you play the flame on it with the other hand.

After determining the space required for 5 minutes of sand, file off the spindle and melt down one end of the tube in the flame until it closes. The other end can be closed after the luminous sand has been introduced.

To make the sand luminous, it must be well mixed with a small quantity of luminous powder. Enough powder is required to coat each grain of sand, but do not use so much that the sand will not flow freely in the timer. This is easily determined by experiment.



Luminous powder is not commonly available, therefore arrangements have been made with the Abbott Magic Novelty Co., Colon, Michigan, to supply small vials of the material for 25c, postpaid. A vial will be all that you will need for making several timers.

The holder for the timer is made of wood, black Masonite (a composition board, for which any similar material, such as plywood, may be substituted) and macaroni alphabet letters and figures. The assembly is shown in Figure 6 while further details are given in the drawing adjacent to it. Drill shallow holes in the wood end pieces to provide sockets for the ends of the timer glass. "V" letters, from the alphabet macaroni, serve as pointers to indicate the proper position of the metal sleeve for the timing desired. Use a watch to time the sand and mark the correct positions for the pointers. The sleeve is merely a piece of spring brass (or other thin metal) bent into a split tube that will fit tighly around the timer glass. Finish it with two coats of fingernail polish.

The lower end of the sleeve is aligned with the proper pointer on the lower half of the timer so that it will be in position when the timer is turned over at the beginning of development. The spot of light will of course disappear when the level of the sand falls inside of the sleeve. As with all similar luminous materials, it is necessary to *allow the sand to absorb light for a short time* beforehand so that it can emit the light in the dark. As only the grains of sand next to the glass can absorb light, the sand will not be luminous as it falls into the lower part of the tube.

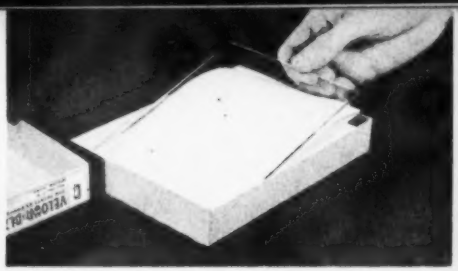
Figure 7 shows how to open one end of an inexpensive egg timer glass in order to add more sand and a little of the luminous powder. The end of the bulb or tube is heated until a small hole can be made with the handle end of an ordinary metal file. Reseal the tube in the flame as already described.

A very simple luminous timer can also be made by marking one side (used as the back) of a purchased sand timer with luminous paint lines, each indicating a minute of sand flow. This is illustrated in Figure 8. As the ordinary sand falls in the glass it reveals one luminous line for each minute of time; or else, sand falling in the [*Continued on page* 171]

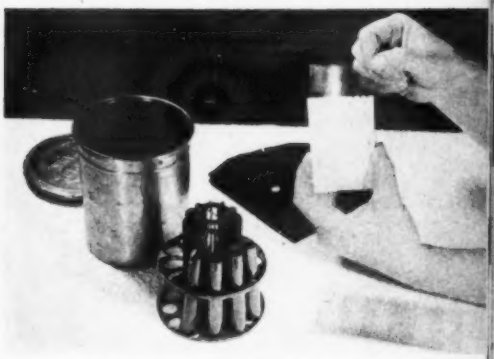
FIG. 8 *(left)*: Still another method of making a timer is to use a regular sand timer with stand and apply graduated luminous paint markings to denote the flow of sand by minutes.

DARKROOM KINKS

Above: Paper-Hypo Test. Immerse a strip of bromide paper in the hypo after exposing to white light. If the greenish paper tint turns white before 1 minute hypo is O.K.—*A. J. Lockrey.*



Above: Enlarging paper may be kept flat in its box without jumping or buckling if a piece of plate glass is placed on top of the upper-most sheet, as illustrated.—*William Swallow.*



Above: Develop cut film in Kodak Film Pack Tanks by backing each sheet with clear celluloid before loading in tank. Remove backings before fixing films in large tray.—*Louis Hochman.*

SMOKE DEVELOPING: Here's a trick that's as confounding as invisible ink-writing. Print a negative on the printing paper for the required time and develop normally. Wash the unfixed print in fresh water for 5 minutes and then place it in a bleaching solution (bichloride of mercury, or any other bleacher) until the image disappears. (Figure 1—*Above and left*). Fix the blank paper for the usual time; then wash and dry it. The photographic image can be brought out in all its original quality by merely blowing cigarette smoke across the emulsion-side of the print as in Figure 2 *(left).*—*Roy Lester.*

LEATHERCRAFT

This ancient art is good for money making and enjoyment.

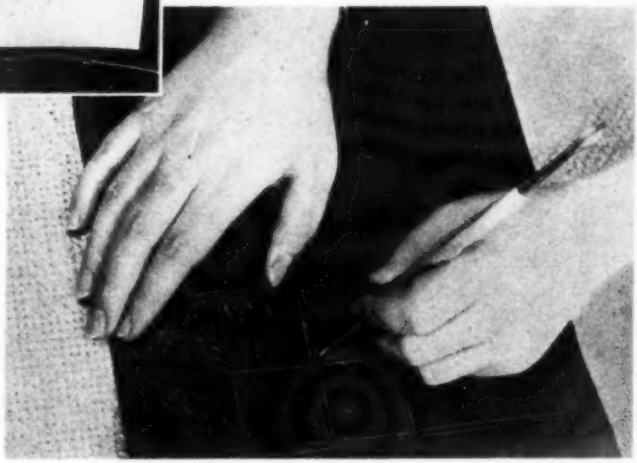
Some of the articles that the amateur craftsman can make from leather are shown at *left*. The small object in the lower *left corner* is a lapel pin made from scraps of colored leather. Key case is done in green, with horse head design. Single-laced lady's billfold is above key case, with double-laced man's wallet to *left*. Belt has cut links.

Here's the correct way to trace the selected design onto the leather. Any sharp, but not cutting, tool may be used, with a ruler to keep straight lines straight. A nutpick is being used for the job in this particular instance. Leather is soft, having been soaked.

LEATHERCRAFT, an art handed down from father to son since earliest times, has become a popular hobby. Anyone can learn the craft of making useful, attractive objects from leather.

This craft has become a source of enjoyment to many who find it both instructive and profitable. After you have purchased your equipment, it will not be long before you are more than reimbursed for your initial investment, for the possibilities of sales are unlimited.

The tools used in leathercraft are simple and inexpensive. Absolutely essential are the modeler, lacing punch, a sharp cutting



Right: Small end of the modeling tool deepens the lines of the pattern. Leather merchants and art supply stores usually carry these tools.

is a Profitable Hobby

by C. M. Green

instrument, such as knife or razor blade, and a tracing tool. Other pieces of equipment may be added as you progress in your work. Some of the desirable tools are the wheel tool, snap applying outfit, stamps, and dividers for marking lacing holes. The bare essentials are included in sets priced between two and three dollars. For a more complete set you will pay from five to ten dollars.

The best leather for tooling is Russia Calf. It works up easily. There are many kinds of leather, but the beginner would do well to start with this one on simple articles, working gradually into larger pieces and more intricate designs.

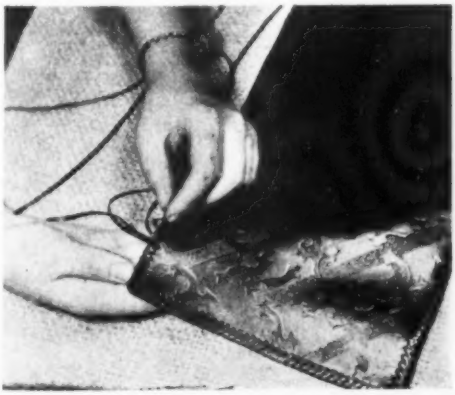
Do not try to imitate factory-made goods. You cannot possibly profit by competing with mass production. The superiority of hand-made articles is in the personal touch that adheres to them. Monograms personalize an article, and it is possible to make designs characteristic of the person who will receive the gift.

For instance, if you know a young man in college and he wants a billfold with a secret compartment, you can make him one with the seal of his college on it. Or if friends of yours are getting married make them a monogrammed table mat. A young bride might be decorating her new home to match, say, her favorite season, autumn. A circular table mat with a ring of autumn leaves in bright colors would be sure to please her.

Modeling a design on a book cover-to-be of brown calf.

A skin of Russia Calf measures about 11 to 14 feet, and costs about 60 cents a foot. You can purchase a half skin, or you can buy leather by the square inch. Of course it is less expensive in large quantities. W. A. Hall and Son, of Chicago, is one of the reliable leather firms that can furnish the necessary materials.

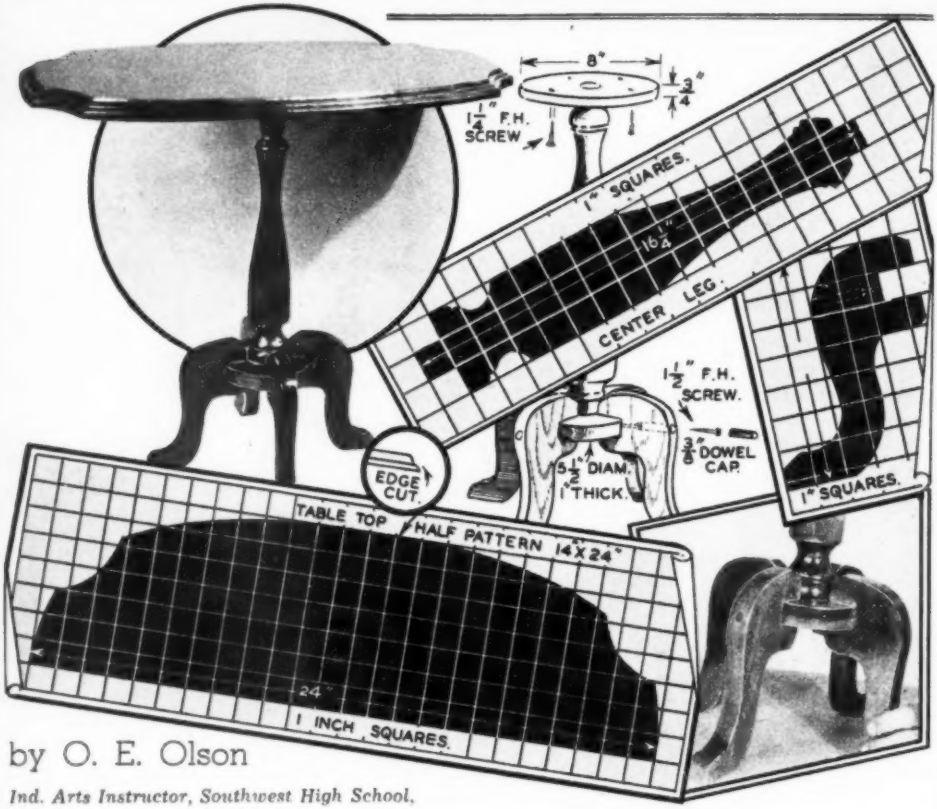
Lining leather [*Continued on page* 140]



A pleasing effect in lacing may be obtained by simply using two strands, as above. The holes for one strand are twice as far in from the edge of the leather as the holes for the other. By alternating the two, the edge can be kept even.

A ruler may be employed to put the tops of the snaps on such objects as key cases. A hollow metal hammer is included in most leather-working outfits to apply the other part of the snap. Zippers, can, of course, be used instead if preferred.

Occasional Table



by O. E. Olson

Ind. Arts Instructor, Southwest High School, Minneapolis, Minn.

HERE is an occasional table of pleasing design and proportion. It is easy to make and employs new features of construction to give it sturdiness, so desired in a table of this type. Any good furniture wood may be used such as black walnut, red gum or mahogany.

Let's start the center leg first, which is turned from 3"x3" stock. Follow the graphed drawing and dress to dimension given. Be sure to turn the upper and lower tenon portion with square shoulders to insure a snug contact with circular plates that fit over them. Next turn the plates, one 5 inches in diameter (lower), and one 8 inches in diameter (upper), on the lathe faceplate. Turn the center holes in each of the plates to take the leg tenons with a snug fit.

The lower legs are cut from ¾" stock. It is advisable to cut a heavy paper pattern of the leg, following the graphed dimensions shown, to insure accurate duplication. Note the countersunk screw and dowel cap in the leg as shown in the lay-out.

The top is made of ¾" stock, and here again it is well to make a half-pattern of heavy paper to get the desired curves. Dress the top with either moulding or beveled edge. The top is held securely to the leg assembly with four flathead screws as shown.

Sand thoroughly, first with coarse, then smooth, sandpaper. If walnut or mahogany is used a filler coat will be necessary to close the grain of the wood.

To finish, use either a stain and varnish, or a varnish finish over the natural wood. However, in either case use at least two coats of good varnish, with ample time between coats for thorough drying.

Victory Designs in Craftwork

You can turn out these striking V-designs on your scroll saw for your home and lawn.

by Edwin M. Love

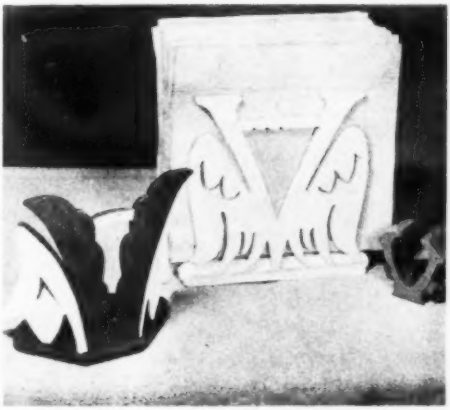
Machine file in scroll saw in place of blade smoothes intricate curves on work. Note that numbers are cut in a single piece.

THE popular patriotic symbol, "V for Victory," lends itself to interesting designs for craftwork, as the five novelties illustrated here prove. All are one-evening projects that make excellent gifts.

The savings bank will prompt a child to save pennies for buying defense stamps. Make a rectangular box, using solid ¾" stock for the ends and pressed wood, textured side out, for the sides. Cut out the V overlays, slot the top and indent the dots with a twist drill, and glue these parts in place. A wood screw in each end of the bottom will discourage robbing of the bank, but make it easy to empty when full. Two coats of aluminum paint give it the appearance of being cast in metal.

Any child would like the napkin ring. Cut it from 1¼" stock, outline the dots and dashes with a small gouge, and paint a bright color. The open top allows the napkin to be inserted from the top.

[*Continued on page* 122]



Above: Left to right, flower pot or vase holder, paper napkin holder, and napkin ring, all made on the V motif on scroll saw.

Attractive V lawn marker with house number shown at right is easily seen from the auto. It helps visitors find your house.

Stretching Rubber

Many rubber articles can be repaired, says the Bureau of Home Economics, U. S. Dep't of Agriculture, and the young lady above demonstrates how to patch a hole in the sole of a pair of rubber boots. Tire repair kit does the job.

NOBODY knows for certain just when rubber for civilian use will again become available—but one thing we *are* sure of; it won't be until the Axis is beaten and the war is over. So you'd better do everything in your power to make useful household articles of rubber (we presume you've already turned in your scrap) last for the duration. Pictured on these pages are a few DO's and DONT's that will help you achieve that objective and make your rubber s-t-r-e-t-c-h.

Don't do this! Copper is a relentless enemy of rubber. Rubber gloves worn when using balls of copper or brass wool to clean pots and pans get sticky and soft, then hard and brittle.

Enemy No. 1 of household rubber is *heat*. The higher the heat the more quickly the rubber weakens, cracks and deteriorates. Keep your rubber gloves away from the stove!

Oil and grease are substances that rubber is allergic to. It's all right for rubber to come in contact with either for short periods (though even this should be avoided if possible) but rubber left around long near either swells and starts rotting. Always clean rubber goods with lukewarm water and soap, or just water alone.

If you want to ruin your boots, galoshes or rubbers quickly, just dry them in the open door of the oven, as at left. Proper way would be to store them in a cool, well ventilated place until dry.

When you put the garden hose away for the winter do it like this. Drain all the water out, coil carefully and tie with strong cord to prevent kinking. Place in a cool, dark, dry corner of the basement.

FLEXIBLE-SHAFT

A tool every workshop needs—and you can build it from scrap parts.

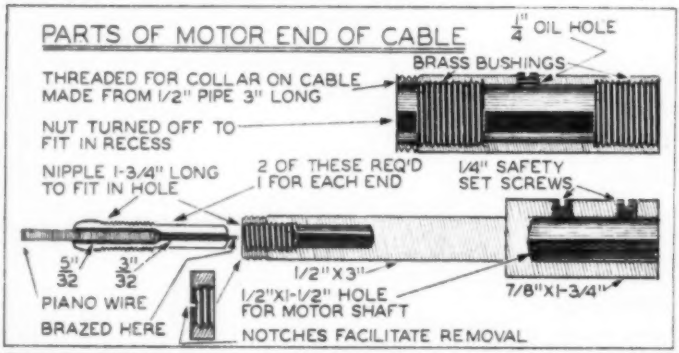
by Benjamin Nielsen

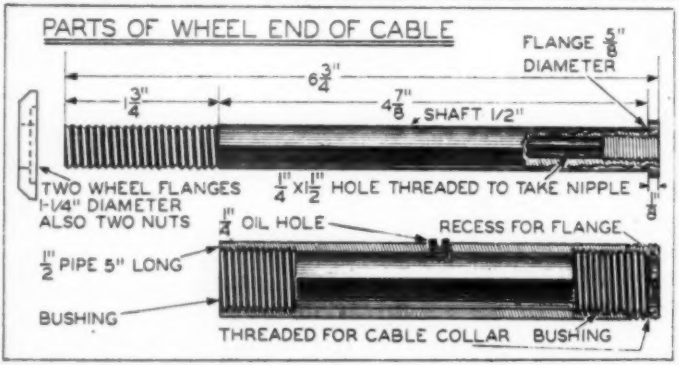
Above: Grinding a cast fitting with the completed tool.

AN EFFICIENT flexible shaft outfit for light grinding and polishing is made using a speedometer cable and heavy wire taken from low bass region of an old piano. If an old piano is not available, this wire may be obtained at musical instrument supply stores. In an auto junkyard find a speedometer cable with attachment collar at both ends, as shown in photo.

The nipple which is slipped over the end of the piano wire is shown in one of the photos. After that nipple and wire are brazed at the end. Both ends are done alike. Turned parts for motor end of the outfit are also shown. The outer shell is simply a piece of ½" pipe, one end of which is threaded to take the cable collar and the inside is fitted with brass bushings to form bearings. A ¼" oil hole is provided in this piece of pipe and is plugged with a small safety set screw. The wheel end of the outfit is shown in photo. The outside shell of this is similarly made from ½" pipe, threaded and fitted with bearing and oil plug. Drawings give complete details on various parts of entire outfit. Before use lubricate cable well with heavy oil.

As with any grinder of this type, it is advisable to wear some sort of protective glasses or goggles, as no shield can be pro-


PARTS OF MOTOR END OF CABLE
¼" OIL HOLE
BRASS BUSHINGS
THREADED FOR COLLAR ON CABLE MADE FROM 1/2" PIPE 3" LONG
NUT TURNED OFF TO FIT IN RECESS
NIPPLE 1-3/4" LONG TO FIT IN HOLE
2 OF THESE REQ'D 1 FOR EACH END
1/4" SAFETY SET SCREWS
5/32"
3/32"
PIANO WIRE BRAZED HERE
1/2"X3"
1/2"X1-1/2" HOLE FOR MOTOR SHAFT
7/8"X1-3/4"
NOTCHES FACILITATE REMOVAL



Complete plans of shaft fittings are shown at *left*. Flexible cable must be securely brazed to fitting at each end. Adjust length of cable carefully to housing.

POWER TOOL

vided. If the tool is used frequently, the comfort of the operator can be enhanced by adding a length of rubber hose over the pipe which acts as a handle. If this is done the hose should be securely cemented to the pipe.

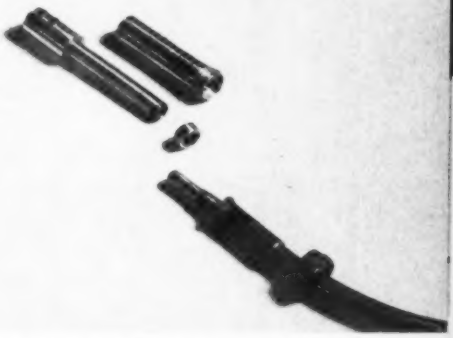
Various grades of grinding wheels may be used on the tool, as the design permits quick and convenient change of wheels to suit the work at hand. In operation the motor can be placed in any convenient spot near the work to be done, as flexible shaft permits grinder to be moved about freely over the work.

Among the various uses to which the tool can be put, that of buffing will probably be one the hobbyist will find handiest. Wire brush wheels may also be attached and used in the same general manner as the others—and here again it is important to wear glasses.

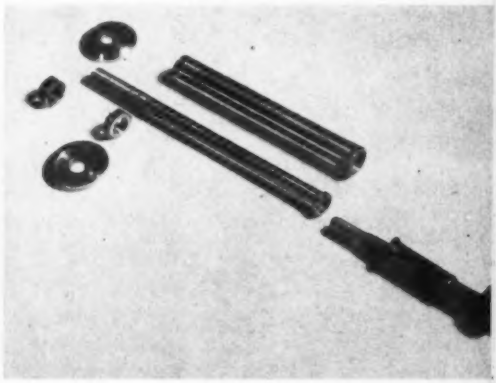
It is convenient in many instances to have a standard type of "on and off" button switch at the end of a cord which can be held in one hand when using the grinder in tight spots. Such a switch might even be taped to the grinder handle to permit easy access.

The shop worker will no doubt think of many uses and adaptations for his flexible shaft outfit, such as occasional use as the power source for other machine tools. With a little ingenuity a small drill chuck attachment can be made for drilling in places too small for a power drill.

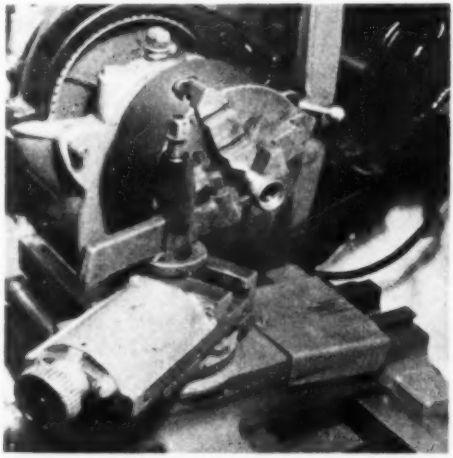
Nipple and bass piano string ready for brazing together.



The parts of motor end of cable appear as above, completed.

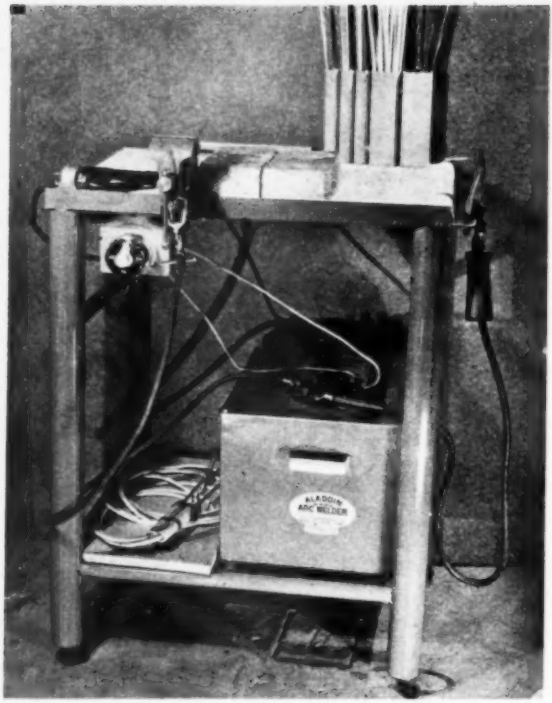


Grinder end parts are longer to provide ample handle space.



Above: Threading section of ½-inch pipe to take cable collar. Collar must screw on snugly to prevent vibration loosening it.

Flexible cable attachment completed. Outside surfaces of pipe have been polished. The one on grinder end serves as handle.



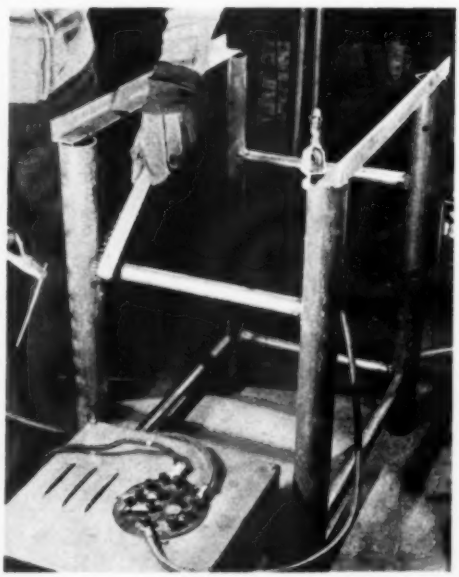
WELDER'S TABLE

Here's an accessory that no welder, amateur or professional, can afford to be without.

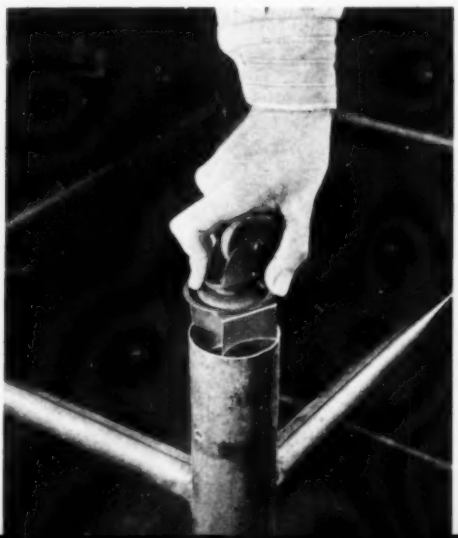
by Walter E. Burton

MUCH time can be saved in the shop by a special welding table built largely of scrap material. The model illustrated was designed for a small electric arc welder, but is adaptable to gas welding and brazing operations. The frame is built entirely of tubular and angular steel pieces from a discarded metal bedstead; but of course water pipe or regular angle iron might be used as well.

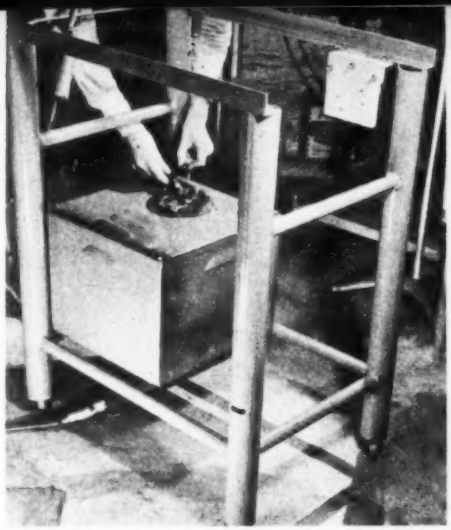
If the welder is to be mounted underneath the table, the size of its cabinet will determine the minimum size of the frame. The table shown stands 37½" high, including rollers; and the top measures 20"x28". Largest tubes from the old bedstead, 2½" in diameter, were used for the corner posts; and sections of smaller tubing as cross braces. There are two such braces across each end, one across



Tubular members and rails from a discarded bedstead are welded together to make the frame of the welding table.



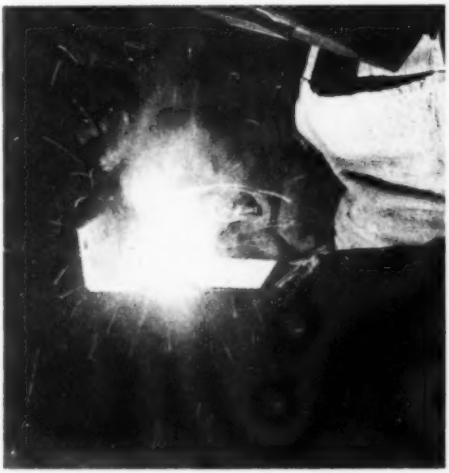
Right: The original bed casters can be used, but heavy-duty ball bearing industrial casters are better, if you can get them.



If the welder is not too large it can be placed in the table frame, as above. Otherwise it can be moved about on its own wheels as a companion to the table. Note switch bracket

the front and back about 8" from the floor; and lengths of the angular bed rails across front and rear at the top. The angle pieces also serve as edges of the table top.

The steel tubing in bedsteads that have an outer skin of thin sheet brass has open seams. Before assembling the table frame, place the corner posts in a vise, squeeze the seams together, and weld them in a half-dozen spots. It is not necessary to tack the cross braces in this way, although [*Continued on page* 133]



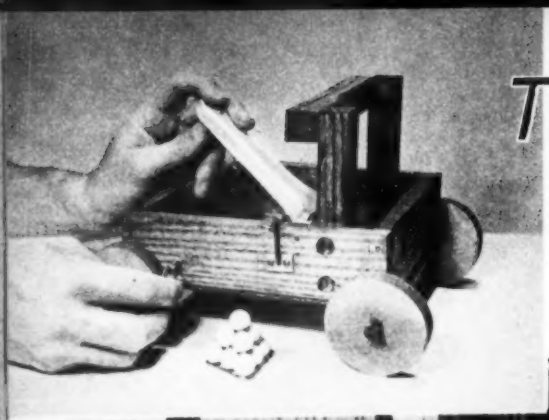
Welding table in use. End of a bolt is being fused over with carbon rod, to prevent removal of nut. Work is in vise.

Right: Partly used electrodes, carbons, etc., are conveniently kept in the easily-made trough until needed.

Installing switch. Piece of plywood holding it is bolted to angle iron bracket welded to frame.

Assembling the electrode rack. Wooden disks in bottoms permit fastening to table top.

Keep the electrode rack filled and you'll never waste time looking for the right size of type.



Toy Catapult

Realistic copy of the ancestor of mobile field pieces.

by Charles and Bertram Brownold

Top: Closeup of the catapult, with pile of ammunition alongside. *Above:* A handy rig for target practice. Inclined board returns shots that miss cans.

THE catapults of the ancient Greeks and Romans were huge and powerful engines of war, built of massive timbers. They were used to hurl rocks over the walls of besieged cities, and while the records are not clear as to the range they possessed, there is no doubt about their being able to throw huge missiles. Research scholars tell us that occasionally they were used to throw dead horses into the beleaguered town in the hope of starting a pestilence.

The throwing arm of the catapult was eight to ten feet long, and the motive power was supplied by a twisted skein of animal sinew about a foot thick. The catapult was built like a four-wheeled cart, and the skein of sinew passed through the cart's sides and was twisted in a forward direction by means of long, crowbar-like levers in the hands of the primitive artillerymen. A crude ratchet prevented the skein from unwinding. The throwing arm was thrust through the center of the skein and was fitted with a wrought iron eye so that it could, by means of rope and pulleys, be pulled down against the twist of the skein, and held in a horizontal position for loading.

Some of the throwing arms were fitted with a leather sling in which the missile was placed, and some had a cavity that received a boulder.

After loading, a hook that engaged the eye in the arm was released and the arm flew up and forward, describing a ninety degree arc, at the end of which it was brought to an abrupt stop by striking a bumper built into the forward end of the cart. At the moment of impact the missile flew from the sling or

Is Model of "Roman Artillery"

Above: Skein of rubber bands is held by hook through side of cart. Note stop latch. *Right:* Two views of throwing arm.

from the cavity with terrific force.

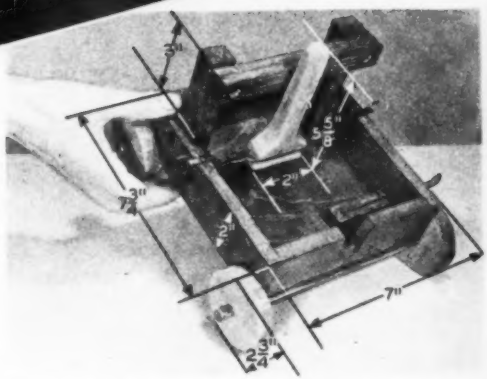
The efficacy of the Greek catapults depended upon the proper selection and processing of the sinews that made the skein. When the Romans conquered the Greeks they copied their catapults and used them to smash through the various Maginot lines of their day on their march toward world conquest.

The toy catapult described here is a copy in miniature of one of these ancient blitz weapons. It's fun to make and use and has surprising "fire power."

The part to make first is the throwing arm. This should be shaped like the one shown in the accompanying photographs, and its size is governed by the size of the ball one intends to use as a missile. It should be tapered so that the end with the cavity is as light as possible. This makes for a lively catapult.

After the arm has been carved, the cart with its bumper can be built the correct size to accommodate it. The catapult in the photographs was built to throw solid rubber balls ⅝" in diameter. Another good ball to use is the little wooden ball sold in five-and-ten-cent stores with various toy games, such as croquet.

The projectile force of the toy catapult [*Continued on page* 169]



Dimensions given above are for a catapult throwing a ball of ⅝" diameter. Size should be varied according to diameter of intended ammunition. Guide for establishing other dimensions will be found at end of text. *Below:* Details of arm.

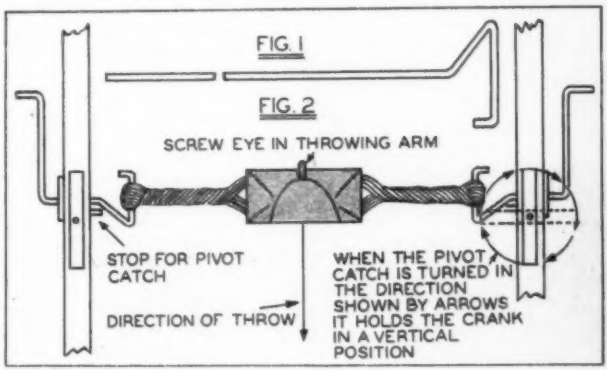


FIG. 1
FIG. 2
SCREW EYE IN THROWING ARM
STOP FOR PIVOT CATCH
DIRECTION OF THROW
WHEN THE PIVOT CATCH IS TURNED IN THE DIRECTION SHOWN BY ARROWS IT HOLDS THE CRANK IN A VERTICAL POSITION

WAGGERY THROUGH AIR POWER

Control your neighborhood air with an umbrella of paper planes. You'll achieve local fame and probably break your lease at the same time.

by Col. Euthanasia P. Whipstall

A GREAT crowd was gathered on both sides of the Kattegat on a warm April evening in 1909. A hush fell over the throng as a slender, pale lad in a mauve Zoot suit stepped toward the water. In his hand he held a simple paper glider, which he launched into the air with a sweeping motion—and made history. The lad, though the perspective haze of ensuing years have made him almost unrecognizable, was myself, and the glider, now known to posterity and the Smithsonian Institution as Whipstall's Winging, finally came to rest four days later in Copenhagen, none the worse for its arduous aerial journey.

Today, I can modestly lay claim to being one of the world's foremost designers of Flollyslods, as paper gliders are known to the initiate. Years of practice making and hurling these little pedestrian-annoyers from high buildings have given me an uncanny sense of air currents and direction; so much so that on one occasion I was able to identify East, West and [*Continued on page* 146]

The author-designer, after a shave, assumes one of his favorite postures while examining a few of his creations. Note straw connecting and bracing twin tails of glider he is holding. Pencil in foreground gives an idea of size comparison, as you can't tell by the Colonel, who rises and falls with the millibars.

COL. EUTHANASIA P. WHIPSTALL

About The Author:

Col. Euthanasia P. Whipstall, world-famed air authority, is perhaps better equipped to discuss Waggery Through Air Power, and perhaps not. After 23 years in high school, Col. Whipstall began as a mere stripling of 37 in the employ of J. J. Foobie, then known as the wizard of the trash pile. From that point on the Whipstall meteoric rise to prominence is an epic of modern history. Enthusiastically hurling tons of rubbish from windows high above the world's greatest metropolises, he gained the everlasting friendship of Foobie, who finally pushed him out. Since that time Col. Euthanasia P. Whipstall has produced some of the greatest aircraft designs known to man, including the *Folding Flooch*, *The Whizzing Flainker* and the unforgettable Gooss-Boolb.

Official Whipstall Photos

The *Pslerkfilb* soars out over the tall rooftops of Manhattan! It rapidly gained altitude until it was at least a thousand feet above its take-off point, then headed East. In the top photo it is almost out of sight in the clouds. At one breathless moment during the taking of these amazing photos, Colonel Whipstall's prehensile toes nearly lost their grip on the stainless steel cornice from which he was suspended twenty-seven stories above the street. Blonde in window opposite was cause.

* Webster's International Dictionary defines waggery as "a bit of foolery; a jest." One possible result is shown above.

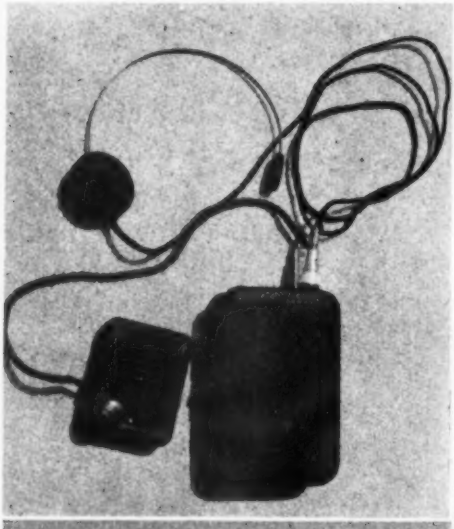
PORTABLE AMPLIFIER Aids the Deaf

Because of its surprising power this amplifier can also be used for other purposes, such as detective work. Extension of "mike" cable is only change needed.

by Walter E. Burton

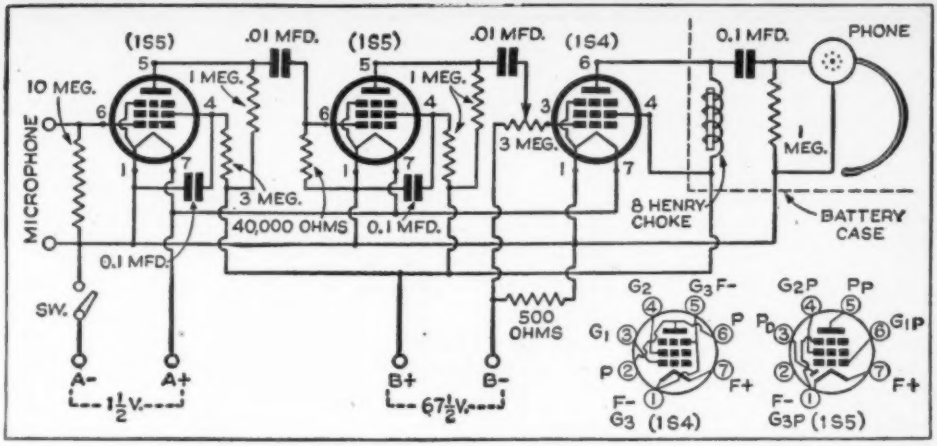
USING three miniature amplifier tubes and powered by standard radio and flashlight batteries, this portable hearing aid is capable of producing great volume with surprising clarity. It was designed by Walter D. Read, for a partially-deaf man who had not obtained satisfaction from other types of hearing devices.

The outfit consists of three units: A battery pack, an amplifier, and earphone. The battery case originally housed a Boy Scout first-aid kit, and it measures approximately 1½"x3⅞"x5½". Half of the space in it is taken up by the 45- or 67½-volt "B" battery. The remainder is occupied by two size D flashlight battery cells, an audio-frequency choke, filter condenser and resistor, phone jack, and a 4-prong connection-plug socket. These parts are arranged as shown, and wired as indicated inside the



The complete hearing aid consists of an amplifier unit with microphone and volume control *(left)*, a battery unit, and single earphone with headband.

Photo *below* shows compact arrangement of the amplifier.



dotted lines of the diagram. The amplifier unit is housed in a small metal box of the type in which soap, cough drops, etc., are sold. This measures about ¾"x2⅜"x3⅛".

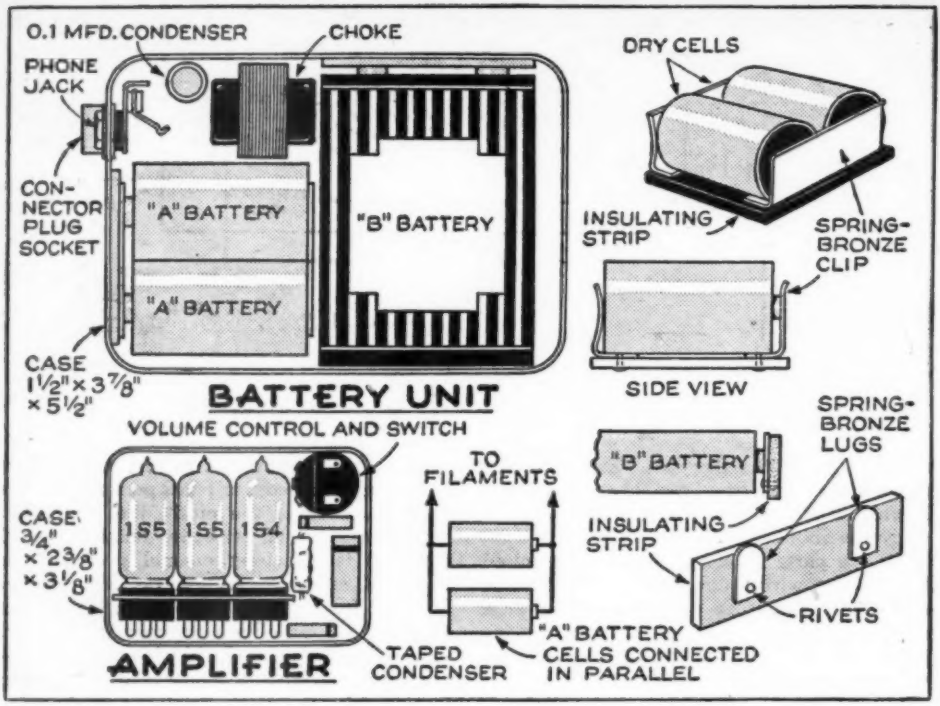
All the parts indicated outside the dotted lines of the wiring diagram are mounted in or on this box. The three tubes and their sockets occupy about two-thirds of the interior, the remainder being taken up by the various condensers and resistors. It was found necessary to remove the cardboard jackets from some of the condensers and replace them with thin cellulose tape, in order to save space. The volume control and switch unit is mounted so its knob is at one corner of the box bottom, which becomes the outside of the amplifier case.

The crystal microphone of 100,000 ohms impedence, is mounted on the amplifier case as shown, and is protected by its grille. The single earphone, to which a flat headband fitted with a pad is attached, is of the crystal type and has an impedence of 100,000 ohms. A magnetic phone of similar impedence could be used instead. The two wires from the earphone terminate in a miniature plug that enters the jack in the battery case. Five wires connect the battery and amplifier units. Four of these carry the "A" and "B" battery currents, and the fifth connects the choke to the plate of the 1S4 tube. The flexible Litz-type wire used as aerials on portable radio receivers is ideal, and the five strands are braided into a compact cable about 12" long. A rubber grommet protects these wires where they pass through the amplifier case.

A heavy safety pin is soldered to the back (lid) of the amplifier unit, and a clip to engage a man's belt is fastened to the battery case. Some users might prefer to carry the battery unit in a coat or pants pocket. Before final assembly of the outfit, the two cases should be given an attractive finish. One of the best is a baking enamel producing a wrinkled surface. If you do not possess facilities for applying such enamel, you can have the job done by a commercial finisher. A local typewriter and adding-machine company will put you in touch with the proper individual or concern. Some users may prefer to have the battery case covered with a cloth jacket.

This hearing aid is simple to use. The volume-control knob also operates the switch. The user simply adjusts the knob until the correct volume is obtained. The builder cautions against using too much volume. The tremendous output of this amplifier, which he estimates at 0.065 watt, when concentrated in one ear might cause discomfort or even damage if unwisely handled. Reducing the "B"-battery voltage would be one way of limiting the volume; but the average user quickly learns just where to set the volume control for best results. Another thing the user must learn is to turn the amplifier completely off when it is not to be used. Many partially-deaf persons cannot tell when this takes place, and may turn the volume control down only until they no longer hear any sound. As a result, they exhaust the batteries sooner than necessary. The switch should turn off and on with a definite click.

The battery unit might be lightened by using a single "A" cell instead of two in parallel. Installing new cells would be necessary at shorter intervals, but this is easy since they are merely slipped into place. Tests with



the pilot model showed that a pair of "A" cells will last about 10 days with severe usage, and the "B" battery will give ample voltage for three months.

For a semi-portable desk set, the various parts can be enclosed in a single, attractive cabinet of wood or metal, and the earphone provided with a longer cord. A handle on top of the cabinet permits it to be carried about.

Parts required for the hearing aid as illustrated are:

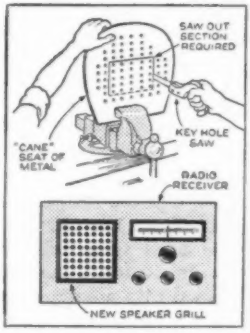
1 small metal box for the amplifier case
1 somewhat larger metal box, such as a Boy Scout first-aid kit, for the battery pack
2 1S5 miniature radio tubes (diode-pentode type)
1 1S4 miniature radio tube (power amplifier pentode)
3 sockets for the tubes
2 .01 mfd. paper type condensers
3 .1 mfd. paper type condensers
1 audio-frequency choke, approximately 8-henry (400 ohms d.c. resistance)

Half-watt carbon resistors as follows:

1 10-megohm
1 500-ohm
1 1-megohm
2 3-megohm
1 40,000-ohm (or down to 25,000 ohms if there is a squeal)
1 2- or 3-megohm carbon volume control, with switch incorporated
1 crystal microphone, 100,000 ohms impedence
1 crystal or magnetic earphone, small type with head band and pad, 100,000-ohm
2 flashlight battery cells, size D
1 "B" battery, 45- or 67½-volt
1 4-prong separable plug
1 small phone jack and plug to fit
8 ft. Litz or similar wire for braided cable and other connections

Crystal microphone and earphone may be Astatic or Brush make. The amplifier housing may be a Packer's Tar Soap or Hexylresorcinol Sucret container.

Radio Grill From Metal Caneing



WHEN the speaker grill of a radio receiver or even the perforated back of the set has become damaged, an excellent substitute can be made from a piece of steel chair seat in imitation of a caneing with chair straw. An old seat can be used if necessary.—*L. B. R.*

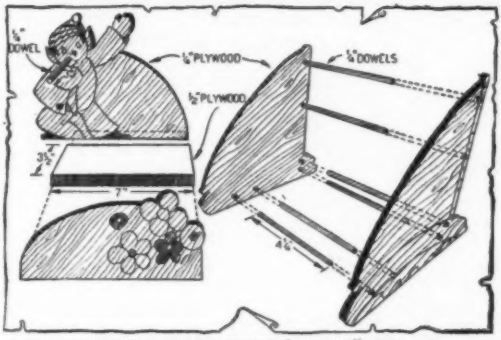
Novelty Napkin Holders of Plywood

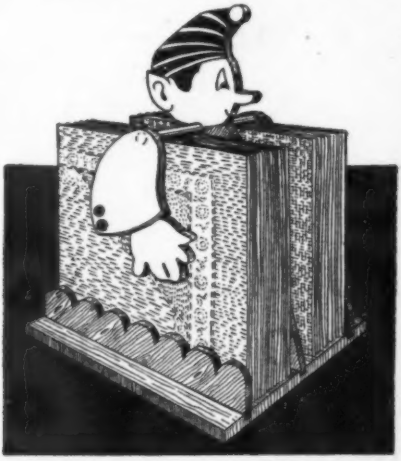
by R. L. Fairall

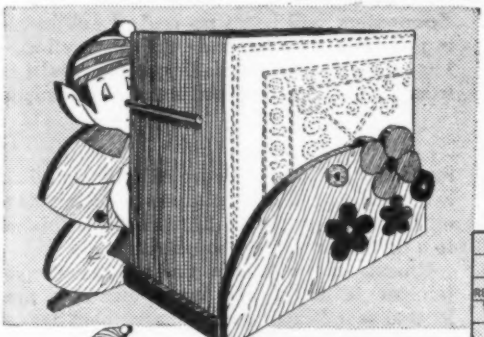
GAYLY colored holders for paper napkins make amusing novelties easily constructed from plywood.

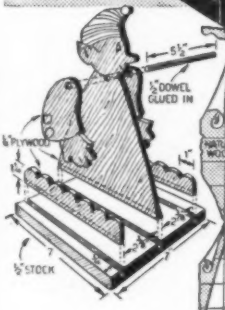
The Brownie holding paper napkins under each arm is jigsawed from ¼" plywood and the arms attached to a ½" dowel 5½" long which is glued through the body and into each arm. The scalloped sections on either side of the figure are also cut from ¼" plywood and all three sections then glued into ¼" grooves in the base (½" plywood 7"x7").

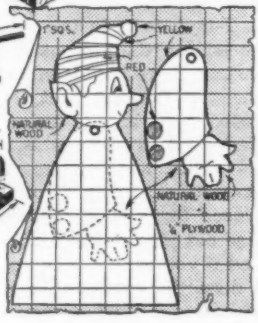
The Brownie peering from behind the napkins, is the back section of this holder and is jigsawed from ¼" plywood; the front section is also cut from ¼" plywood and these nailed to [*Continued on page* 170]

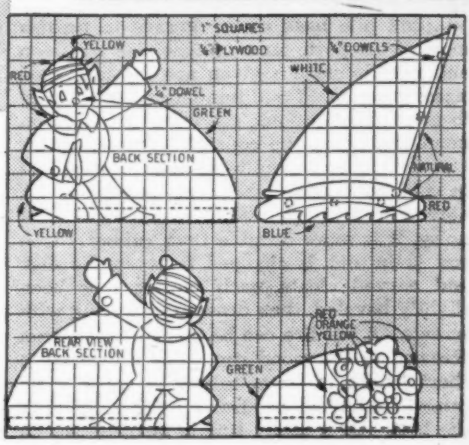


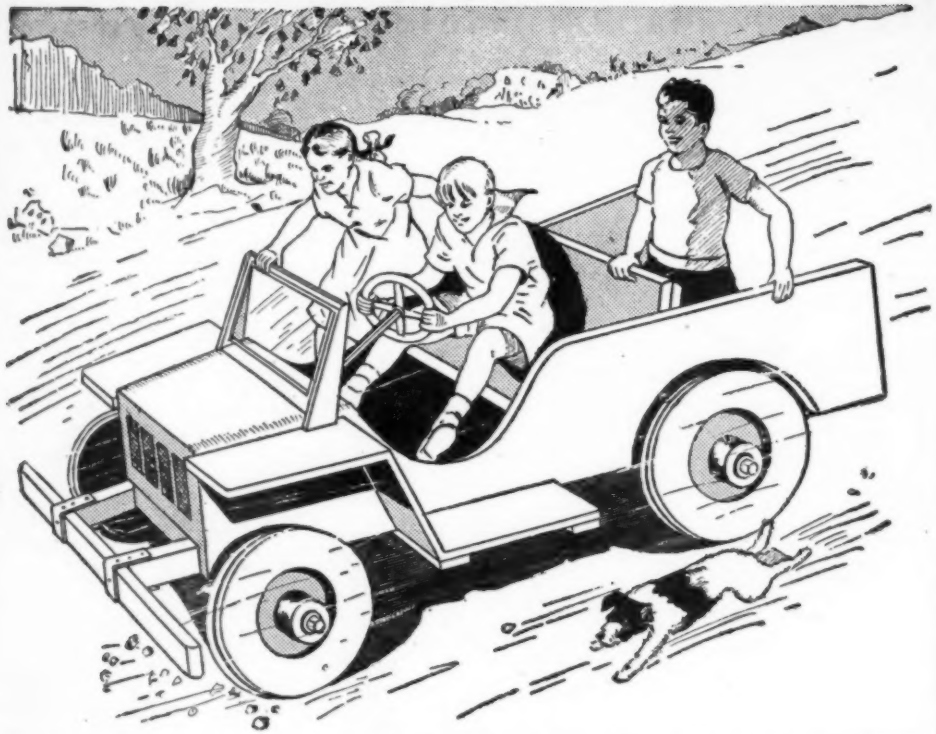












JUNIOR JEEP FROM JUNK

Youngsters will have no end of exhilarating fun with this rugged and snappy looking miniature Jeep—and you can build it from left-over lumber and workshop scraps.

by Hi Sibley

THERE should be enough material in the junk pile back of the garage to furnish most of the parts for this little coasting Jeep and the dimensions given are the preferred sizes; if you don't find lumber and other stuff to meet specifications, use what you have on hand and adapt the construction to meet it.

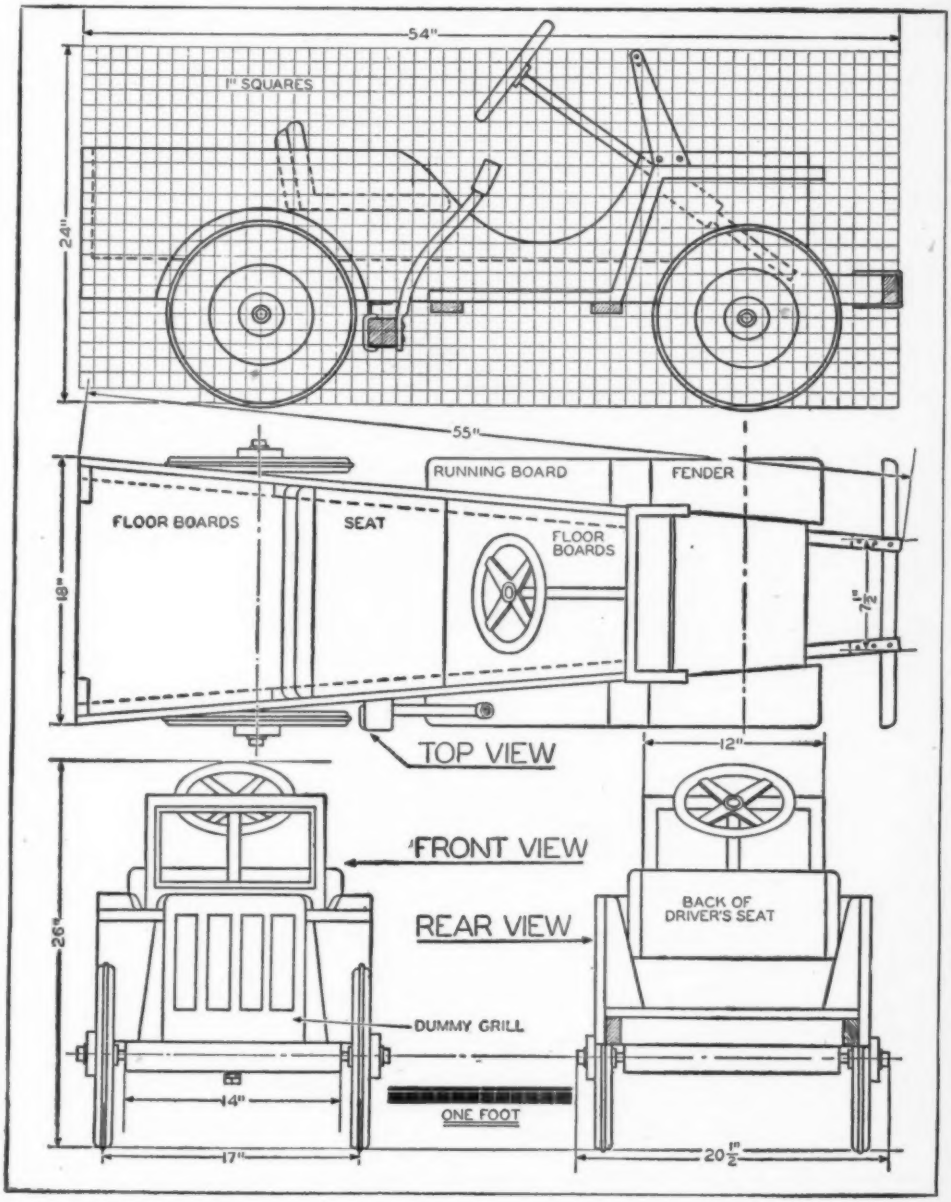
A novelty is the built-up wood wheels, just in case no coaster wheels are available. A narrow iron tire permits lots of speed, and if noisy, it is more durable than rubber. Iron rod ¼-in. dia. is clamped between the disk and curved cleats, each having first been slightly beveled, then drawn down snug with screws. A flat tire can be made of strap iron screwed to the wood rim. For a bearing, a short length of brass tubing is good; if no brass is to be had, use iron pipe of a size to fit the bolt. Or a really simple bearing can be made of a bushing or sleeve of hardwood that has been soaked in a mixture of lubricating oil rich with graphite. This sleeve is driven to a tight fit into the wood disk.

Chassis frame tapers toward the simple bumper in front, and cross members are located as indicated on the chassis plan drawing. Axles consist of two-by-three's with half-inch bolts in the ends, forced into holes bored for the purpose. Ends of the wood members are bound with strap iron. To keep the steering cable taut, a long eyebolt is provided with an old valve spring, as shown. Sash cord serves as cable, and is crossed under the drum, which it leaves at right angles to prevent climbing. Note that one pulley is placed forward of the other for this reason. Use old pipe or tubing for the steering post, and if you cannot pick up a small wheel from a discarded pushmobile cut down the spider of a Model T wheel and make a rim of ply-

wood, iron rod or garden hose with heavy wire inside.

The brake beam is hung on two hinges, and pieces of old tire used for "lining" which contacts the rims of the wheels. A brake lever can be made of bicycle tubing bent as illustrated, a straight piece of pipe flattened at the end and bolted to the beam, or merely a piece of hardwood. This hand lever is pushed forward to apply the brakes.

Boards from old crates, shipping boxes or radio packing cases can be used for the body and top of hood; numerous cleats make it possible to use short lengths. If you care to

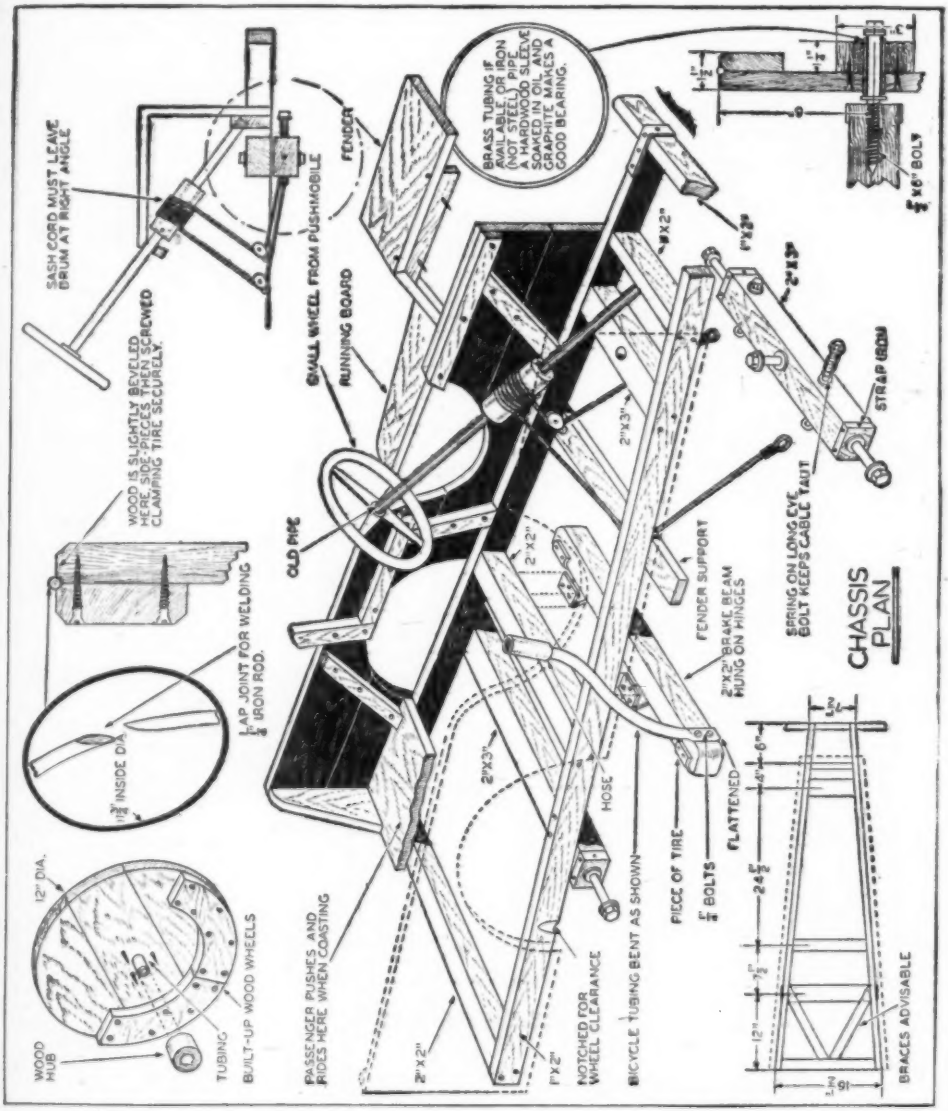


try anything as ambitious as a windshield, make a frame for celluloid and cover the edges with wood moulding, mitered at the corners. When the driver's seat is installed, locate the footboard for his convenience. The "passenger" gets a ride when coasting; otherwise he is obliged to supply the pony-power.

The only color should be olive-drab, with gray for the "tires" or wood sidewalls. A trim of black here and there will set off the monotone olive-drab.

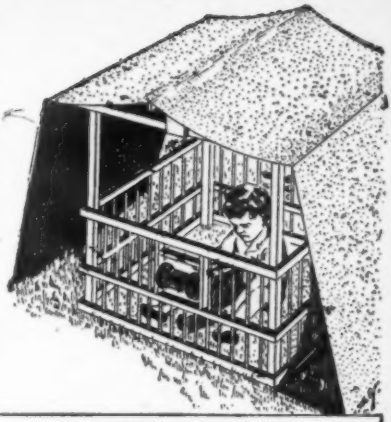
In areas where continuous dimout precautions are not required, a set of head and tail lights can be added to the Junior Jeep. These can be made easily from small inexpensive pocket flash lights, and with a little imagination it won't be hard to add sheet metal or pasteboard blackout shields.

Another set-up that is always popular with youngsters consists of dry cells for the lighting, wired to a switch and ammeter on the dash, then to head and tail lights.


SASH CORD MUST LEAVE DRUM AT RIGHT ANGLE
FENDER
BRASS TUBING IF AVAILABLE OR IRON (NOT STEEL) PIPE. A HARDWOOD SLEEVE SOAKED IN OIL AND GRAPHITE MAKES A GOOD BEARING.
⅜" BOLT
SMALL WHEEL FROM PUSHMOBILE
RUNNING BOARD
WOOD IS SLIGHTLY BEVELED HERE. SIDE PIECES THEN SCREWED CLAMPING TIRE SECURELY.
OLD PIPE
STRAP IRON
SPRING ON LONG EYE BOLT KEEPS CABLE TAUT
FENDER SUPPORT
2"X2" BRAKE BEAM HUNG ON HINGES
CHASSIS PLAN
LAP JOINT FOR WELDING ½ IRON ROD.
INSIDE DIA.
12" DIA.
WOOD HUB
TUBING
BUILT-UP WOOD WHEELS
PASSENGER PUSHES AND RIDES HERE WHEN COASTING
HOSE
PIECE OF TIRE
⅜ BOLTS
FLATTENED
BICYCLE TUBING BENT AS SHOWN
NOTCHED FOR WHEEL CLEARANCE
BRACES ADVISABLE

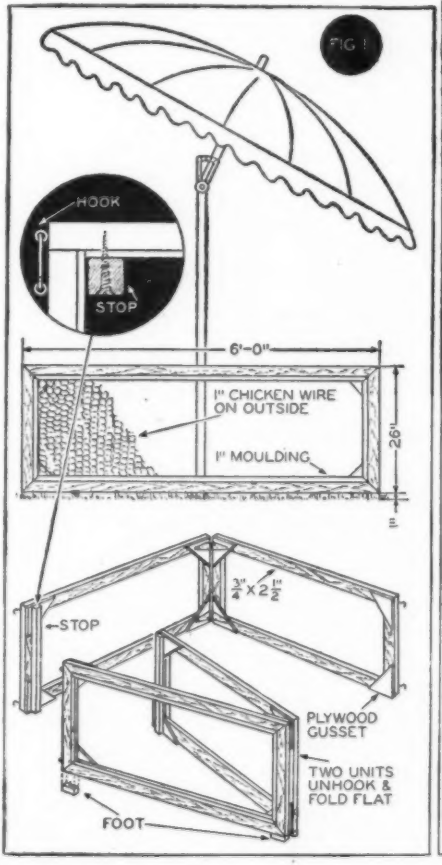
Two Play-Pens

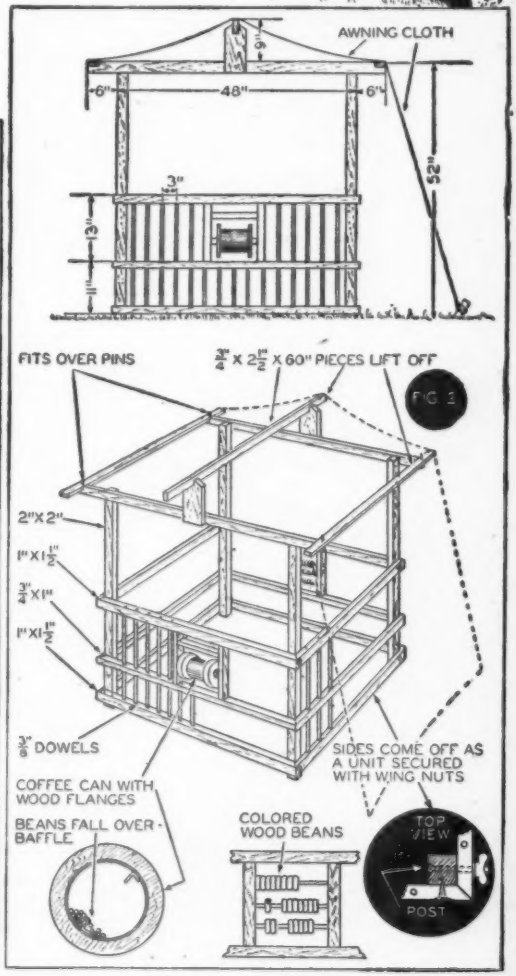
by Hi Sibley

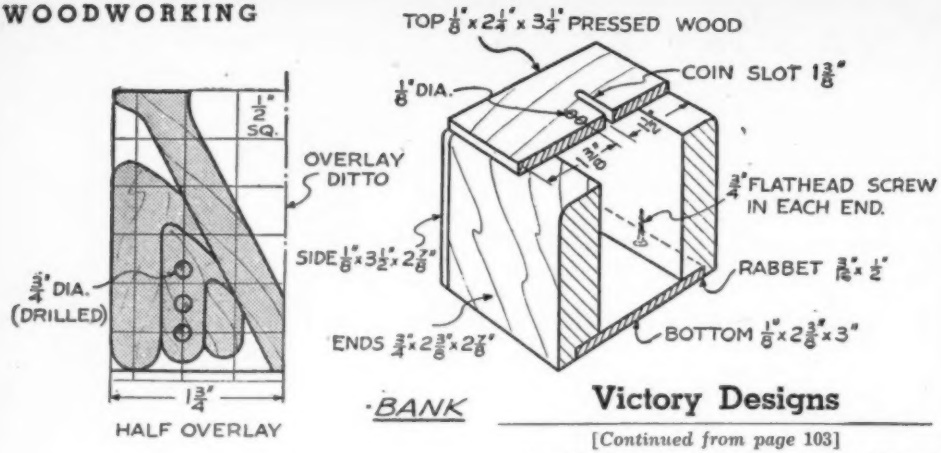


A VERY simple but safe play-pen can be made of four frames covered with chicken wire and hinged in pairs with hooks and eyes to form a square enclosure as shown in Fig. 1. An inexpensive beach umbrella provides shade. When not in use pen and umbrella can be folded up and stowed away.

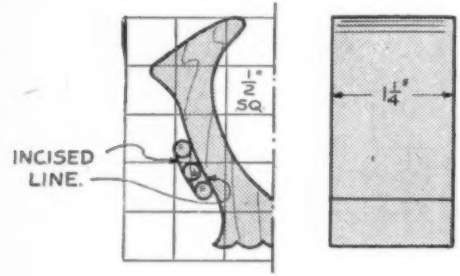
Frames may be of any material on hand so long as the wood is not likely to splinter. As further precaution against splinters, plane and sandpaper the edges smoothly. Install the screen on the outside of the frames and cover with battens or half-round molding. Inside four plywood gussets will reinforce the frames, and are necessary if the frame members are mitered at the [*Continued on page* 158]



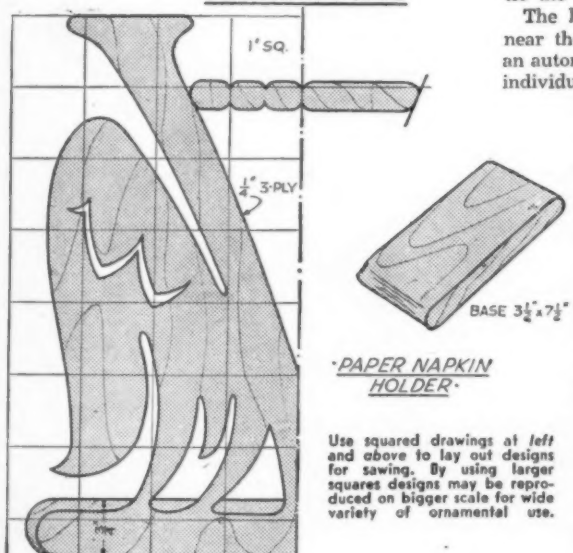



TOP 1/8" x 2 1/4" x 3 1/4" PRESSED WOOD
COIN SLOT 1 3/8"
1/8" DIA.
OVERLAY DITTO
3/4" FLATHEAD SCREW IN EACH END.
SIDE 1/8" x 3 1/2" x 2 7/8"
RABBET 3/16" x 1/2"
3/4" DIA. (DRILLED)
ENDS 3/4" x 2 3/8" x 2 7/8"
BOTTOM 1/8" x 2 3/8" x 3"
1 3/4"
HALF OVERLAY

·BANK·



NAPKIN RING



·PAPER NAPKIN HOLDER·

Use squared drawings at *left* and above to lay out designs for sawing. By using larger squares designs may be reproduced on bigger scale for wide variety of ornamental use.

Victory Designs

[*Continued from page* 103]

As with the bank overlays, the two sides of the paper napkin holder are scroll-sawed from two pieces of plywood tacked together. Glue and brad the sides to the base, and finish in cheerful colors with enamel or lacquer. A full package of napkins can be held in this novelty.

The flower-pot holder has a leap-like V in front with wings extended at an angle from the sides. Scroll-saw tenons on the lower ends and make mortises in the base to fit. Grind off the forward edges of the wings to fit against the edges of the front, and glue these parts. Paint V and wings in contrasting colors, and carry the V-color around the edges of code and wings to tie the design together.

The lawn marker places the house number near the sidewalk where it can be read from an automobile. The number, of course, demands individual drawing, but the figures can be easily fit to the top of the V. Cut from solid stock, with the number and code unit a separate piece, if desired, with the grain running horizontally. Paint the figures with aluminum, while the code and standard are finished with color. Use weather-resisting paint.

Where it is necessary to mount the lawn numbers and the V symbol against a flat wall a very attractive effect can still be obtained. It is naturally necessary that the scroll saw work be painted in a contrasting color to that of the background. This is done most easily before mounting, and the mounting is accomplished by means of a few light nails. Do not nail it too firmly in place, as it may be necessary to remove it sometimes for repainting.

On many lawns the design and numbers can be placed on a tree near the sidewalk. The dark bark of the tree contrasting nicely with a light color on the design.

The V-design also lends itself to weather vane construction. On this type of project the dots and dashes should be arranged so as to ornament the portion of the vane normally carrying the arrowhead.

The large V is used in place of the "feather" at the rear of the arrow, as its surface area is greater than the code portion, and provides the necessary effect of turning into the wind. A piece of nominal 1x1 soft wood makes a good base. The pivot should be set near the balance point of the unit, but sufficiently far forward to assure that the major effect of the wind will be on the tail portion.

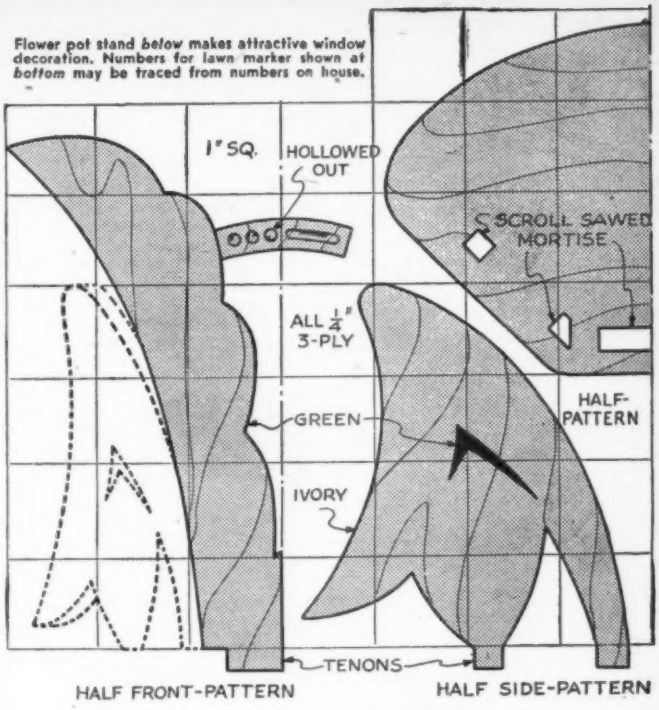
A low friction pivot can easily be made by boring a vertical hole through the 1x1 and pressing in a short length of metal tubing. A bolt fitting loosely through the tube, with a few washers on the underside as a bearing, completes the job.

In mounting a weather vane of this type it is advisable to provide a short pole to support it a little distance above the roof itself. This eliminates to a considerable extent the effect of wind eddies around the building. Where breeze is usually light the pivot shaft should be of small diameter. A glass bead on the shaft between two of the washers aids greatly in reducing friction.

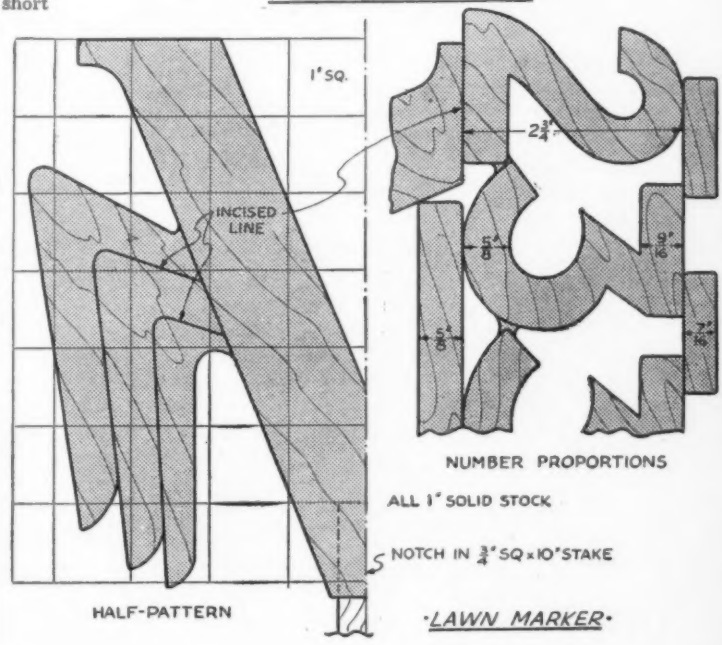
NEXT MONTH!

Winter will soon be here and many of you readers may begin thinking about a little ice-boating. The November issue of MI will carry plans for building a 4-runner iceboat of latest design. Don't miss it!

Flower pot stand *below* makes attractive window decoration. Numbers for lawn marker shown at *bottom* may be traced from numbers on house.



·FLOWER POT STAND·



·LAWN MARKER·

IDEAS for SERVICE MEN

BLACKENING RIFLE SIGHTS—Before going on the rifle range, obtain a small bottle of benzol from the drug store, and load your cigaret lighter with it . . . preferably one of the inexpensive, large capacity wind proof lighters. Benzol ignites more readily than any regular lighter fluid, and gives off an intense black smoke which is ideal for smoking sights—and much handier than burning a chunk of shoe polish, or carrying a carbide lamp for the purpose. DON'T use a benzol-loaded lighter when going out to dinner . . . your hostess will be very unhappy to note the soot falling for five minutes each time you light up!

USING EMPTY CARTRIDGE CASES

Few things provide more useful possibilities to service men, sportsmen and mechanics than a box of odds and ends of fired cartridges.

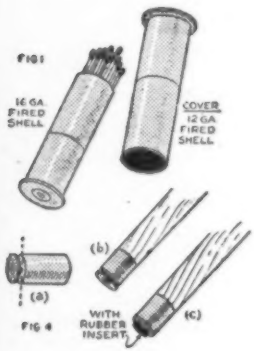
An excellent match box is the well known combination of an empty 16 gauge shell as a container, telescoped into a 12 gauge shell for a cover (Fig. 1). Since the paper shells are specially treated to make them damp proof, they afford good protection—but if the matches are previously dipped into melted paraffin they will be wholly serviceable even after prolonged immersion.

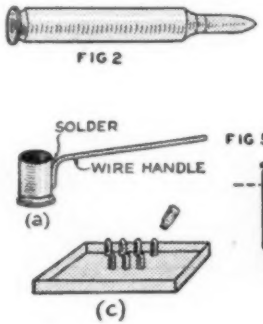
The bottle-necked "high power" rifle cartridge (Fig. 2), such as the 30-06, the 7 mm., .270 Winchester, 30-30, 35-Whelen, and many others, provides brass of high quality for many uses.

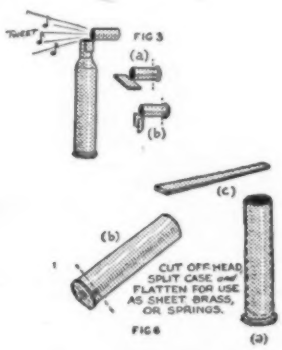
An excellent whistle for training dogs, or for use on a bicycle, or any other signalling purpose, is shown in Fig. 3. The head is cut off a smaller cartridge, and one end then split and cut partly off to form a lip (a) and bent as shown at (b). This is then soldered to the neck of a large rifle cartridge, forming the mouthpiece of the whistle, and slightly flattened and bent as necessary to give the desired tone. By soldering two of these, in different sizes, side by side, a two-tone whistle of very pleasing effect may be made.

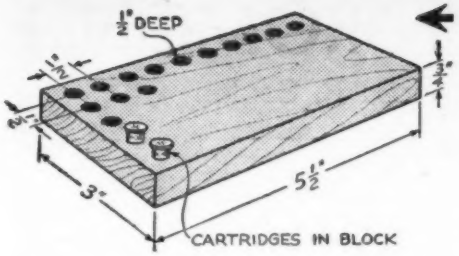
Large pistol cartridge cases, such as the .45 automatic, make excellent ferrules for small tool handles (a, Fig. 4). Cut off head through the cannelure and drill hole for the tool shank, as shown by the dotted lines, and fit to the handle. Such a cartridge case, or the older style with rim, makes an excellent tip for a walking stick (b), while by drilling a large hole through the head and into the stick, a rubber tip may be inserted and cemented with thick shellac (c, Fig. 4).

Hand loaders of ammunition will also find uses for short pistol cartridges in the making of powder measures for quick handling of light loads where fractional grain accuracy of measurement is not required. Solder a wire handle to the empty cartridge case as shown (a, Fig. 5), then file down top edges until the measure will hold the exact amount of a given powder required, using powder scales or apothecary scales as a guide. For accurate results, dip from a box kept fairly full of powder; do not









THE LUBRICATION ON .22 CALIBRE CARTRIDGES makes them somewhat messy to handle when a single-shot target rifle or pistol is used. A very simple solution to the difficulty is a cartridge block that holds the ammunition rim end up. This can be made in about ten minutes out of any piece of scrap wood 5½ by 3 inches and about ¾ inch thick. A whole box of cartridges can be accommodated if five rows of ten holes each are drilled as shown. A standard ¼-inch drill is just right for the job. The technique is to load the block with the bullet ends in the holes, wipe one's hands of lubrication, and pick each cartridge out of block by its clean rim end. This makes shooting a pleasure by eliminating greasy fingers.

jar or shake, but simply strike off the surplus powder with a straight edged stick. With most powders this method is usually accurate to ½ grain, and it will be found convenient to make several such measures for different loads and powder, scratching the necessary data on the measure with a sharp scriber.

Another "gadget" most useful to the hand loader is the "cake cutter" for use in lubricating bullets (b, Fig. 5). This is made by cutting off the head of an empty, previously fired case of the same caliber of bullet being used. The cast bullets are then stood points up, in a shallow pan, then melted lubricant poured in around the bullets until the level reaches the top groove (c, Fig. 5). When cooled, the cake cutter is pressed down over each bullet, cutting it free from the lubricant in the pan. Each bullet is successively pushed up through the cake cutter, leaving the bullets clean, and with the grooves just filled evenly with lubricant.

Large straight taper cases, such as the 32-40, 38-55, 45-70, and other "old timers" afford an excellent source of supply for high grade springs for model work and other uses. This type of case (a, Fig. 6), is fairly thin at mouth, the metal being much thicker near the head, as shown by dotted lines. By cutting off the head and splitting as shown by dotted lines (b, Fig. 6), a sizeable piece of sheet stock may be obtained. From this, very useful springs may be cut as shown at (c, Fig. 6); or if small pieces of even thickness are needed, the thick end may be hammered out after first annealing by heating the brass to cherry red in a gas flame and instantly dropping into water.

BREAKING IN A NEW PAIR OF SHOES is never fun at any time—and often particularly tough in the Army. A good plan is to put on two pair of light woolen socks, soak the soles thoroughly in water, put the shoes on and walk until they dry. This will limber them up and set them comfortably to the feet in a single treatment.

High shoes are particularly hard on the ankles of men accustomed to low-cuts, and the service shoes appear to have uppers made of galvanized iron. Soak the ankle portions thoroughly in water before wearing; protect the "knuckle" bones of the ankles with one or two large felt bunion pads, with two pairs of sox over them. Lace up the shoes as tightly as you can stand them, and walk till they are dry. This will not only limber up the uppers, but will form them to a comfortable fit over the ankles. They should of course be well polished after drying, to soften the leather.

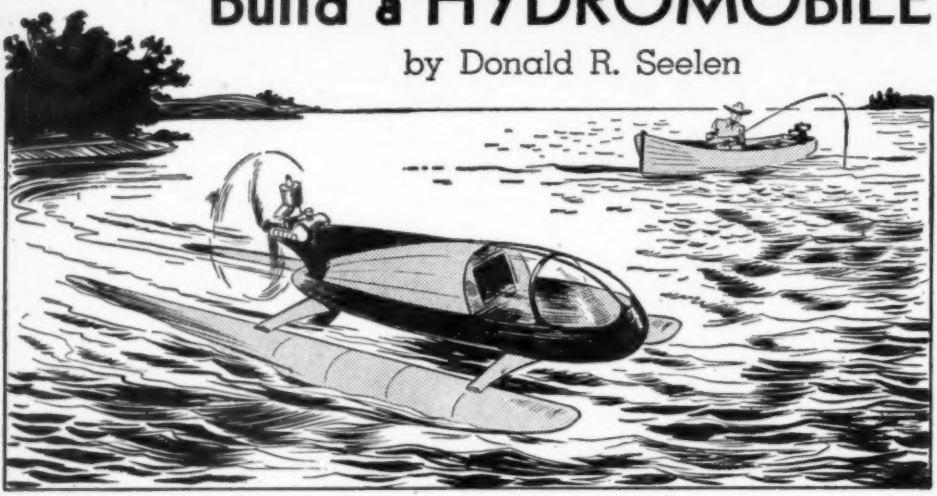
PAPER BAGS—large sized ones of heavy manila paper,—will contribute greatly to "health and comfort" of the soldier or sailor . . . get your grocer to donate half a dozen a month, and send them to the boy. He will use one for a laundry bag—and later as a wrapper for his laundry. Another will provide wrapping material for the birthday gift he is mailing to Dad or Mother. His girl friend's letters which he can't bear to throw away, will be kept safely folded away in still another. And who knows—another may serve as a repository for a large, thick sandwich wheedled from the mess cook, to see him through a lonesome guard shift some dark, rainy night. And be sure to include a few yards of stout wrapping twine when sending the bags.

DRESS BLUES are often ruined by their [*Continued on page* 164]

MODELS

Build a HYDROMOBILE

by Donald R. Seelen



FOR spectacular and versatile performance you'll be hard put to find a model that can top this fast-stepping three-way amphibian. It literally does everything but fly, and you can try adding a pair of wings for that too, if you're so inclined. We wouldn't doubt that the critter would take off after a little adjusting and fussing around. To get back to earth, however, this model was modern-designed to run on land (whoom, whoom), on sea (zip, zip, z-z-z-i-p) and on the ice (no noise established for this as yet). The "legs" which extend out from beneath the teardrop body can carry wheels, pontoons or runners, according to the season and the builder's whim. For power, a fifth or quarter horse model gas engine is recommended, though a sixth or even seventh h.p. kicker will drive the Hydromobile at a fair rate of speed, especially on ice, where 40 or 50 m.p.h. is possible with an Ohlsson 23 or similar light motor. In the water or on land though, the more powerful motors will make a big difference, and the original model did an estimated 35 m.p.h. in water with a ¼ h.p. engine.

You're undoubtedly itching to get started building the Hydromobile by this time, and the first step is to go over the plans very carefully. Don't just look at them; *study* them until you think you understand how the model is made. Then get busy with paper and pencil and compute a list of the materials you'll need. In this way you will become familiar enough with the job at hand to minimize chances of mistakes when you actually get to work.

Body Construction:

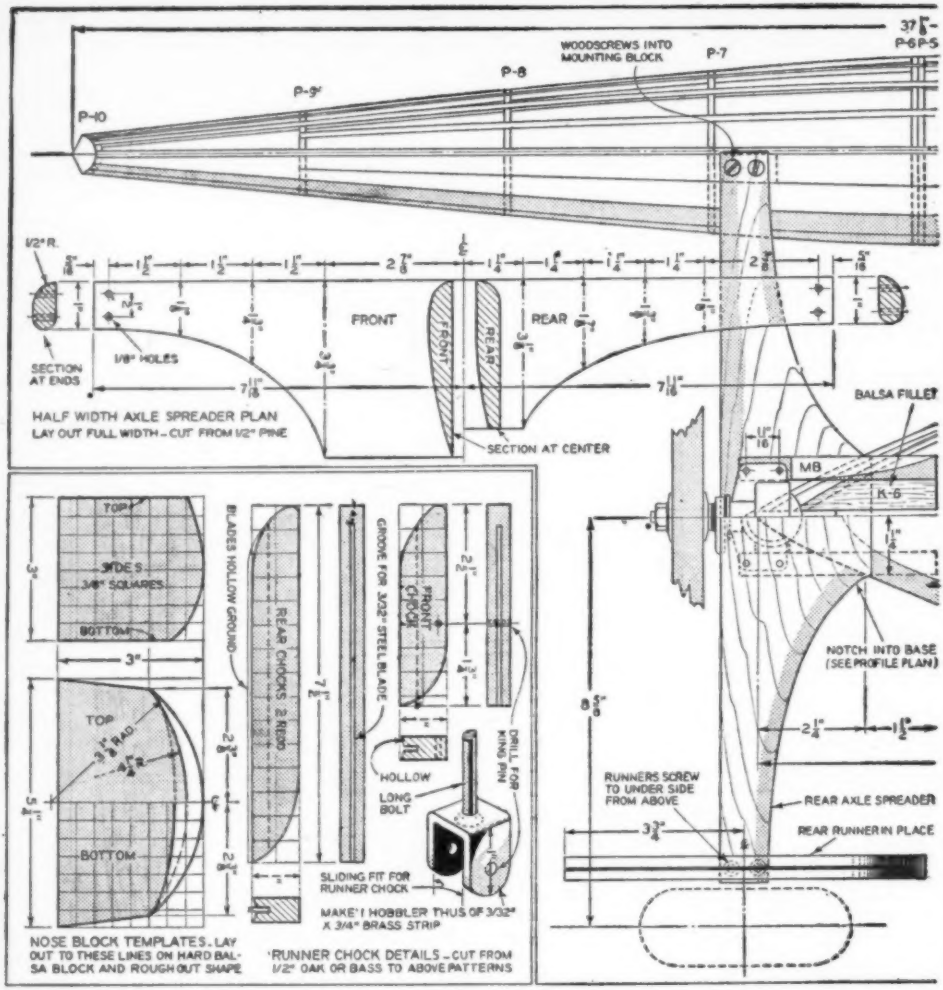
Start with the base. For this a piece of ½"x8"x24" white pine is needed. Make a full size and full width pattern from the half-width bottom plan given and cut the board to this shape. Round the bottom edges off and sand smooth. Next the nose block is cut to shape from a piece of hard balsa 3"x3"x5½". Rough out the block to the general shape and glue it in place on the front of the base board. It can be trimmed and sanded to exact contour after the body assembly is completed.

Now cut out the two side formers. These are best cut from white pine and should be shaped to the dimensions and outline shown in the squared plans. Glue and nail these side pieces to the base board and to the nose block. The demountable window section of the cabin will later rest on this foundation.

The various body formers should now be cut to the patterns given and from ¼" hard balsa throughout. In cutting these formers due allowance should be made for the bevels which occur at almost every station as a brief study of the plans will reveal. After cutting out all the formers the actual body assembly can be started.

Glue the formers K-3, K-4 and K-5 together and mount the whole on the rear end

This plan shows the side view of the Hydromobile's framing. Letters in circles identify formers or patterns, which are laid out in squares in another sketch. Pontoons are drawn in above, with wheels and runners shown in dotted line.

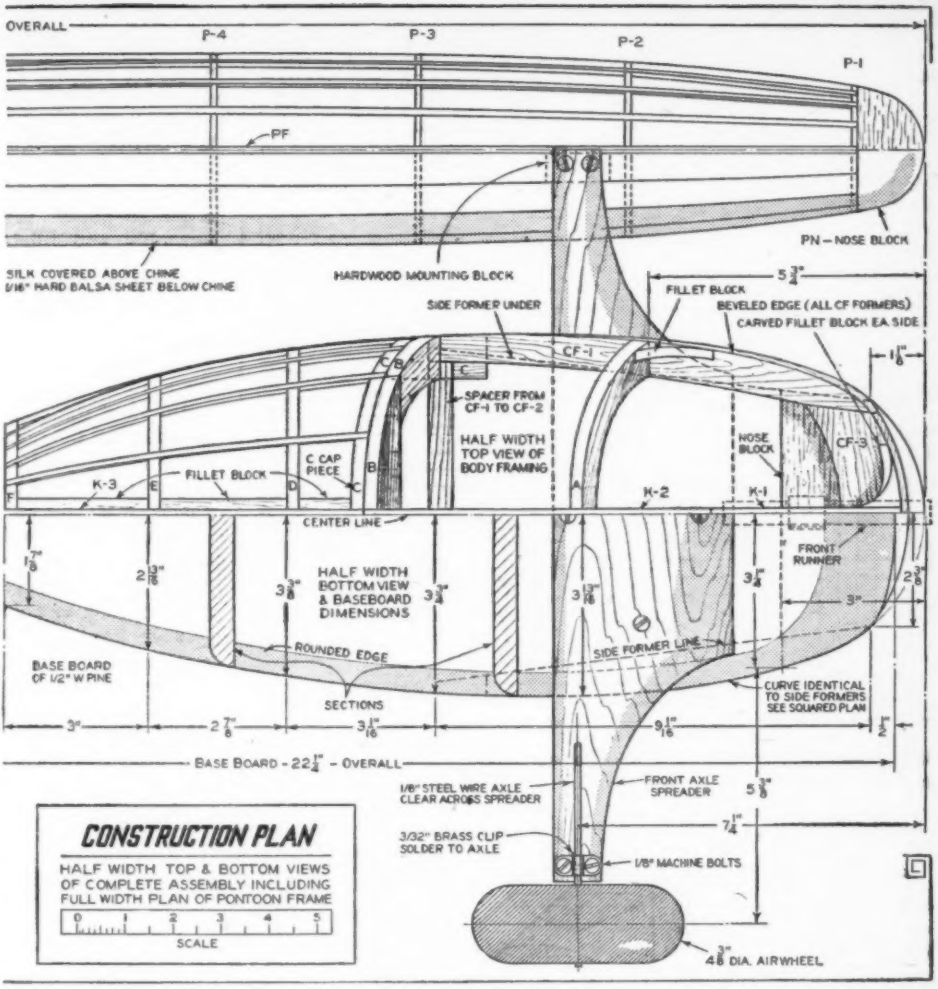


of the base board. The former C is next glued together (it is comprised of 2 side pieces and a top or cap piece—see patterns) and glued to the base and flush against the after ends of the side formers. The dorsal fin, or former K-3, fits into a notch cut in the top of former C. Next, mount the remaining formers, D, E and F, which should be glued to the base and against the formers K-3 and K-4.

The body stringers, five each side, may be of hard balsa but basswood is preferable. In any case the stringers should be of 1/8"x1/8" stock. Glue them in place in the notches but check the alignment of these notches before actually glueing. The stringers should carry a fair line from former C to the tail and if formers have been pre-cut for notches some alterations may be required to establish the desired fair lines. This, however, is a minor detail and easily handled on the job.

Motor Mount:

The motor bearers are next on the program. Cut them from 1/2" basswood, or if that is not obtainable, from white pine. Glue them in place against former F and to



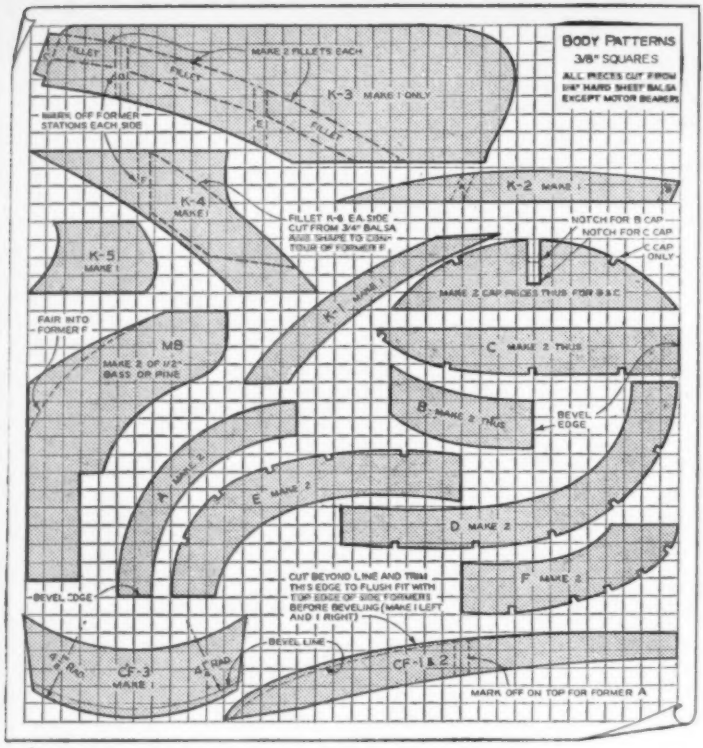
The drawing above, when placed with inside edge coinciding with inside edge of drawing on opposite page, gives a full top view of the model, with pontoon shown on one side and wheel and runner on the other. All running gear may be quickly interchanged, as it is held to struts with screws. Details of runners and nose block are at extreme *lower left*.

the base. The spacing given for the formers is to suit a Brown Jr. motor and the spacing may be changed to suit the motor bolt spacing of the actual engine used.

Fillets:

To complete the body framing, fillets of hard balsa should be glued in place between formers C & D, D & E, and E & F. These fillets are glued to former K-3 and should be cut to follow the curve shown in broken lines on the pattern for K-3. Two more fillets, one left and one right should be carved from hard balsa and fitted to carry the body lines from Former F between the motor bearers and K-4 to stringer No. 2. A pattern is provided for these pieces but actual fitting is best done by trial and error. The purpose of all these fillets is to afford suitable purchase for the covering and, in the case of the two latter fillets, to carry out the body contour in places where covering requires a more substantial foundation than is provided by the stringers.

The body framing is now complete and


BODY PATTERNS
3/8" SQUARES
ALL PIECES CUT FROM 1/4" HARD SHEET BALSA EXCEPT MOTOR BEARERS
MAKE 2 FILLETS EACH
FILLET
K-3 MAKE 1 ONLY
MARK OFF FORMER STATIONS EACH SIDE
K-4 MAKE 1
K-5 MAKE 1
FILLET K-6 EA SIDE CUT FROM 3/4" BALSA AND SHAPE TO CONTOUR OF FORMER F
K-2 MAKE 1
NOTCH FOR B CAP
NOTCH FOR C CAP
C CAP ONLY
MAKE 2 CAP PIECES THUS FOR B & C
K-1 MAKE 2
FAIR INTO FORMER F
M8
MAKE 2 OF 1/2" BASS OR PINE
C MAKE 2 THUS
B MAKE 2 THUS
BEVEL EDGE
A MAKE 2
E MAKE 2
D MAKE 2
F MAKE 2
CUT BEYOND LINE AND TRIM THIS EDGE TO FLUSH FIT WITH TOP EDGE OF SIDE FORMERS BEFORE BEVELING (MAKE 1 LEFT AND 1 RIGHT)
BEVEL EDGE
BEVEL LINE
CF-3 MAKE 1
CF-1 & 2
MARK OFF ON TOP FOR FORMER A

MODELS

Left: Reproduce these formers actual size on cardboard, then use resulting patterns to cut wooden pieces. See top and side views for parts location.

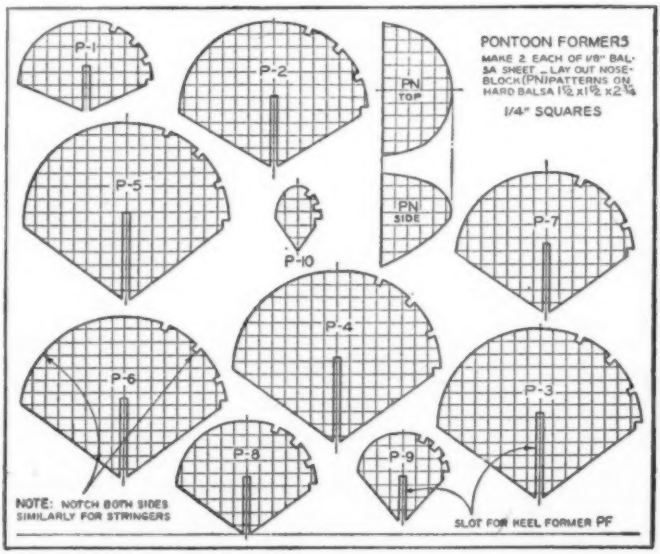
is glued between the base formers flush with the B end in order to stiffen the assembly and fillets are glued in place at the nose and at former A for the same general purpose.

Bevel the CF formers to follow the contours of the body and sand off the nose block carefully. Before removing the nacelle mark off and drill for the dowel pegs or locate the hinge which may also be used to hold this section to the main body.

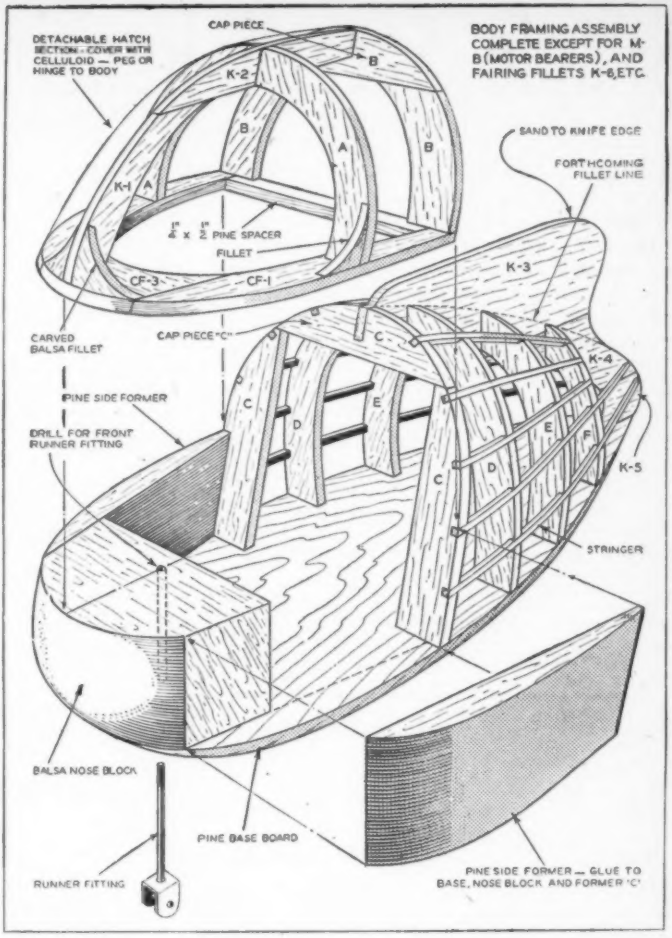
Before covering the body the nacelle should be removed. Also the spreader boards which serve as mounts for either runners or pontoons should the removable transparent nacelle or hood can be started.

Transparent Nacelle:

This is built directly onto the body framing in order to insure fair lines but it should not be permanently attached as, after completion, this section is intended to be easily removable in order to get at the batteries and other accessories which may be carried inside. Glue the formers CF-1, 2 and 3 together to form the base and pin the whole temporarily to the side pieces and to the nose block. Now assemble the formers A, B, K-1 and K-2, glueing them to the base formers. A spacer piece of ¼"x½"

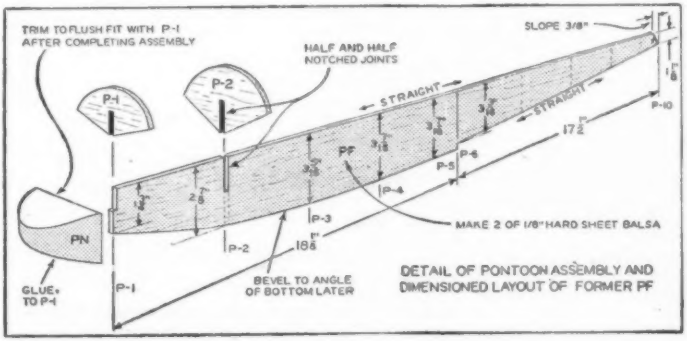


be cut out to the pattern given and attached to the base board as shown in the plans. The rear spreader is glued and screwed in place but the forward one should be screwed only as it has to be removed when the car is used with ice or snow runners. Note how the aft spreader is notched into the base board in order to give the whole body a slight angle of incidence.



Covering:

The whole body with the exception of the nacelle may be covered with silk pongee, bamboo paper or voile or the silk covering may be used only over the stringer section of the body. A better job results from the complete covering and this is recommended. Put the silk on with a medium thick model airplane glue and shrink several times with water before doping. Three thin coats will suffice for the priming and great care should be taken to smooth out all wrinkles during this process. If bamboo paper is used smooth it out as cleanly as possible, then wet it before doping. The water will shrink it to a tight fit.



Painting:

Any color combination can be used. The original was finished in blue to the window level, red below and pontoons in silver throughout. Do not apply the paint too thick and use any of the model airplane lacquers available for best results.

Windows:

The entire window section or nacelle is

[*Continued on page 164*]

Simple Screen Repair

HOUSEHOLD

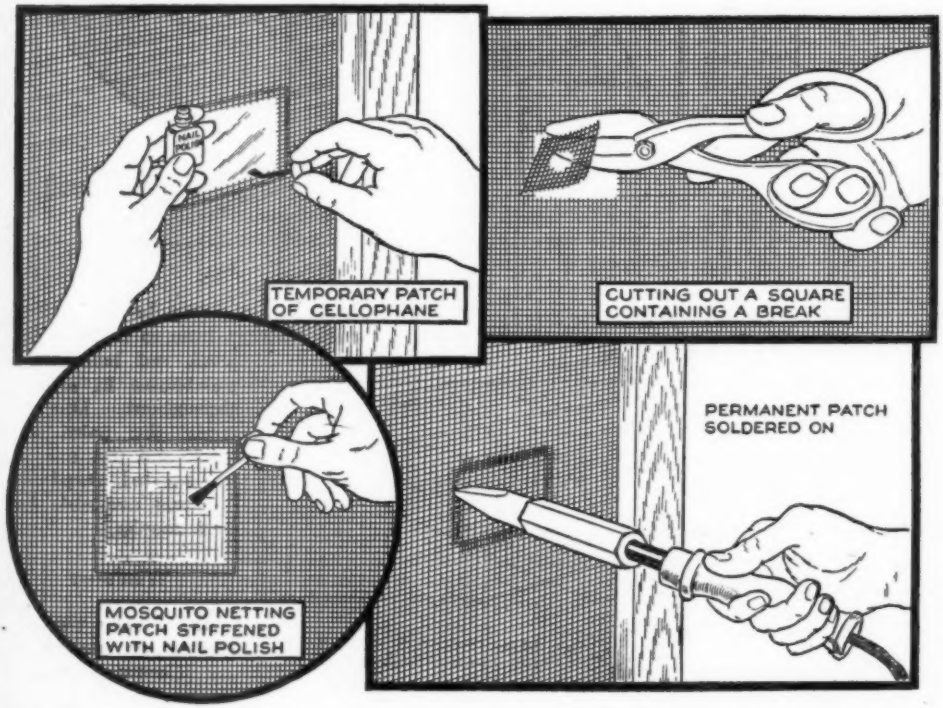
by Ken Murray

Those screens may have to last a long time. Fix them now!

AFTER galvanized window and door screening has been exposed to the weather for a few months, moisture finally penetrates through pores of the zinc coating and rusting of the iron wire commences. For this reason it is advisable to paint new screens immediately before they are put into use, or before storing for the winter, and to repaint them as often as necessary. The wire will then remain intact for years. When regular screen paint is not available, ordinary black stove polish will afford considerable protection if it is used once a month or so. It can be applied to small screens quite easily with an ordinary pipe cleaner without filling the mesh.

When you notice that the wire of an old screen has become broken, repair it immediately. Unless the break is very minor, it is best to cut out a square piece and replace it with a patch of the same size. Scraps may be used for making patches. A neat, practically invisible patch is made by soldering. Cut the patch so that it is slightly larger than the opening and matching ends of the wire overlap slightly. Line up each set of wires with tweezers and solder them individually. Paint the repair so that it blends with the remainder of the screen. This repair can also be used effectively on copper screening, minus, of course, the paint job.

A second-best patch, when wire screening is not available, is to use black mosquito netting. While it does not afford an entirely invisible patch, it is practical and strong and will last for years. Attach the square of mosquito netting with cellulose cement or fingernail polish applied at the lap. After this is dry, lightly coat the netting with thin fingernail polish, which will stiffen and protect the threads. A temporary patch may be cut from clear Cellophane.


TEMPORARY PATCH OF CELLOPHANE
CUTTING OUT A SQUARE CONTAINING A BREAK
PERMANENT PATCH SOLDERED ON
MOSQUITO NETTING PATCH STIFFENED WITH NAIL POLISH

[*Continued from page* 109]

some rigidity might be added.

The table-top is a thickness of ¾" boards, reinforced by three crosspieces underneath, resting on the angle strips. Over this is a fire-resisting layer of one or more thicknesses of asbestos paper, a layer of thicker asbestos such as that used for house shingles, or a sheet of steel.

The "accessories" are what makes this table so handy for miscellaneous or production welding. One of these is a support extending across the right end for holding the electrode holder. Bend a length of ⅜" iron rod to the shape shown in Fig. 4, and weld the ends to the frame so there will be about 2" space between the rod and the table edge. The electrode holder hooks easily over this support; and various spring clamps, etc., used to hold work or to attach the welder cable to the work can be clipped to it when not in use.

The "pipe organ" arrangement at the rear of the table top is for holding spare welding electrodes. It is made by welding [*Continued on page* 160]

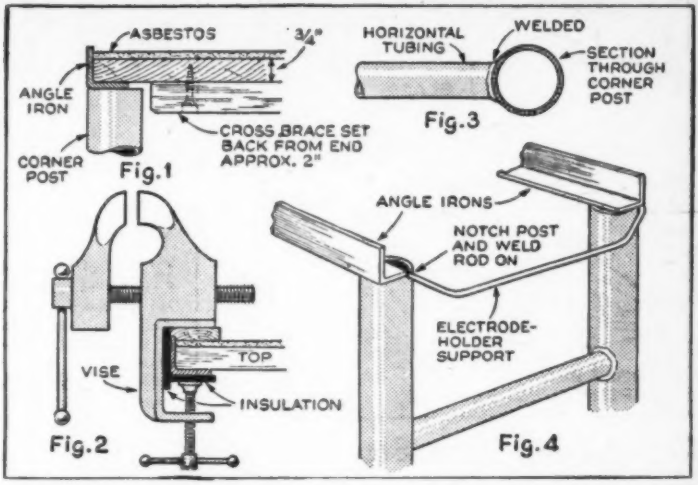
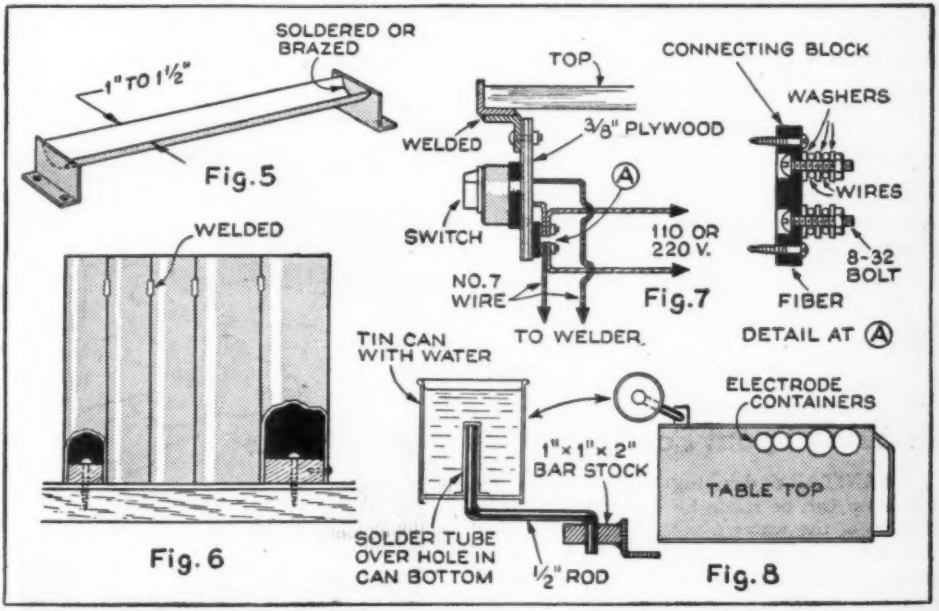
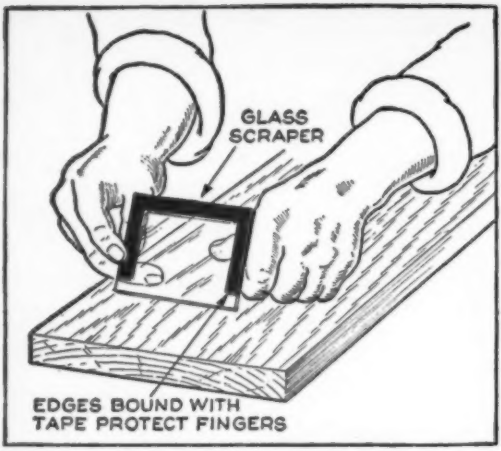


FIG. (1) Detail of top, showing angle iron (along front and rear edges only) welded to top of corner post. (2) Vise for holding work is insulated from table by strips of plastic, wood, or other non-conductor. (3) Ends of cross braces are cut or hammered to fit contour of corner posts roughly, then welded into place. (4) A rod across one end of the table and about 2" from the edge of the top is a convenient place on which to hang the electrode holder. (5) Trough for short pieces of electrodes, etc., is made from steel tubing or pipe split lengthwise to form half-round section. (6) "Organ pipe" electrode containers are made from steel tubing welded together. Wooden plugs in two or more tubes enable the arrangment to be fastened to table top. (7) Switch circuit of welder shown in photos. Flexible cord is heavy-duty, capable of withstanding heavy input current. At A is shown detail of connecting block, which should be covered with protective cap of some sort. (8) Suggested water-can accessory for cooling work. Water container made from large tin can.



WORKSHOP AIDS

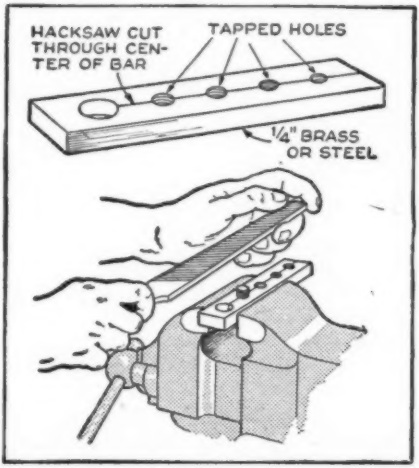


Glass Scrapers

PIECES of broken glass (with edges cut straight) are often superior to steel scrapers for smoothing wood surfaces, removing paint, etc. As an edge dulls it is quickly renewed by cutting away some of the glass. Glass scrapers can be cut to fit concave, convex or irregular surfaces, thus reaching corners and other places not accessible to sandpaper or conventional scrapers.—*W. E. B.*

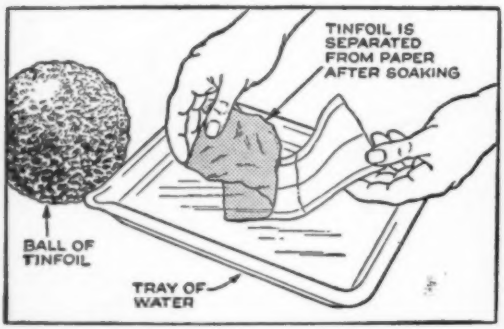
Cutting Machine Screws

THE device shown at right permits the quick and clean cutting of machine screws. A brass or steel bar ¼" x 3" is drilled with four or more holes corresponding in size to the screws to be cut. The holes are then tapped, a large hole drilled near one end, and a cut with a jeweler's hacksaw made down the exact center of the block. In use, a machine screw is turned into the appropriate hole and the device placed in a vise. Thus the screw is firmly held without damage to its threads while it is being cut to proper size.—*R. F. Y.*



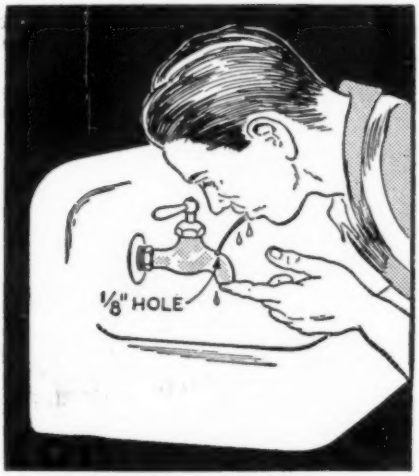
Retrieving Tinfoil

IF YOU are saving pieces of tinfoil, badly needed for war purposes, you will find that the foil can easily be separated from the paper backing by merely soaking it in lukewarm water for a few moments.—*K. M.*



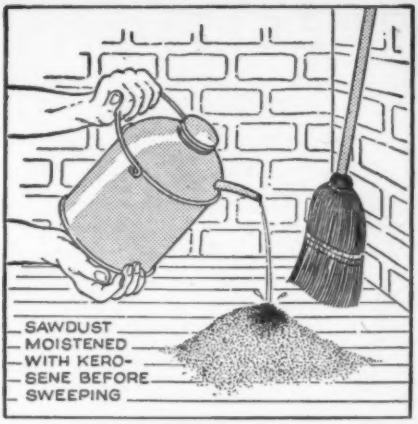
Drinking Spout For Shop

A SANITARY drinking spout for the small shop can be made by drilling a ⅛" hole in the top of the water faucet as at right. Placing the finger under the outlet will cause a thin, steady stream of water to squirt from the hole. Function of faucet remains unimpaired.—*H. R. W.*



Dustless Sweeping

FOR sweeping a shop floor free of dirt that includes the finest dust, nothing beats a sweeping compound made by moistening sawdust with kerosene. Use just enough oil to moisten the wood particles thoroughly; and do not leave any of the compound lying around after the sweeping is done.—*W. E. B.*

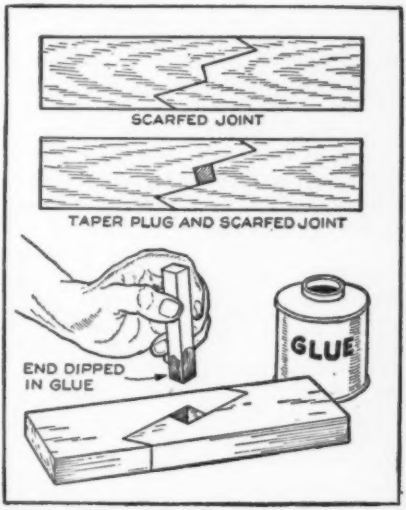


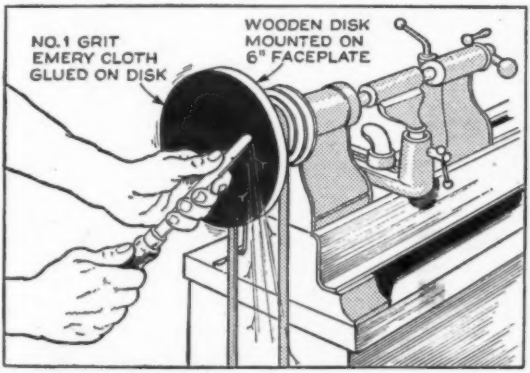
Thumbtack Lifters

ARTISTS, draftsmen and others who use thumbtacks a great deal can overcome the annoyance and broken fingernails that generally accompany their removal by placing a short strip of thin leather under each tack.—*W. S.*

Pull-Resistant Joints

CRAFTSMEN can aid the war effort by making use of small pieces of wood that they would ordinarily throw away. For joining the ends of slender pieces that must resist tension as well as twisting and bending, one of the joints shown at right will be found useful. The plain scarfed joint resembles a double dovetail that runs diagonally across a strip of wood made of two joined pieces. The taper-plug-scarfed joint is identical except for the addition of the plug that forces the parts of the joint tightly together.—*W. E. B.*

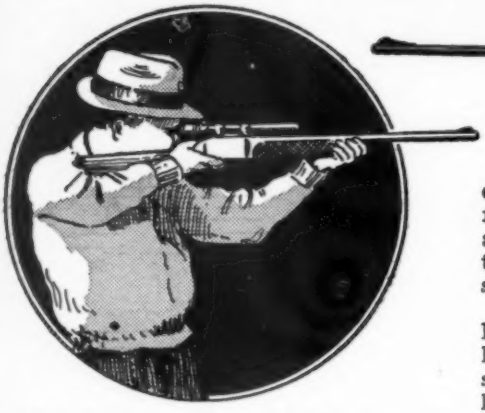


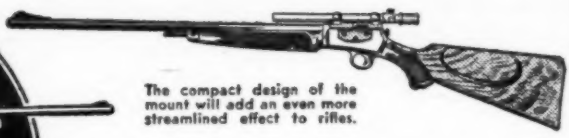


Sanding Disk Grinds Lathe Chisels

TIME spent sharpening chisels when wood turning is done can be reduced if a carborundum-faced sanding disk (No. 1 grit emery cloth) is mounted on the outboard end of the headstock.—*E. M. L.*

PRECISION SCOPE MOUNT





The compact design of the mount will add an even more streamlined effect to rifles.

This handsome telescopic sight mounting for your rifle can be made in your shop.

by Clyde Baker

EXCELLENT hunting telescopic sights for rifles are now available at a cost of around $15.00 or even less; but the mounts which come with these good, but inexpensive scopes are seldom attractive in appearance, and usually lack many of the features which a "cranky" shooter demands; while the type of mount we should like to have costs, we find, anywhere from $17.00 to $40.00, plus an additional $5.00 or so to have it properly attached to the rifle.

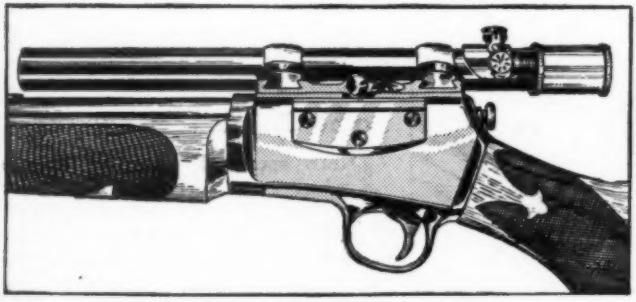
The ideal hunting scope mount should be, first of all, "bull strong" to stand up; it should be possible to remove the scope and replace it on the rifle as often as desired, without in any way affecting the zero adjustment, both lateral and vertical, once they have been set; and finally, it should bring the scope to the lowest possible position on the rifle—barely clearing the top of the receiver—so that the rifle may have a neat, streamlined appearance, and with a scope sighting line not materially higher than that of the original iron sights . . . this to assure good stock fit.

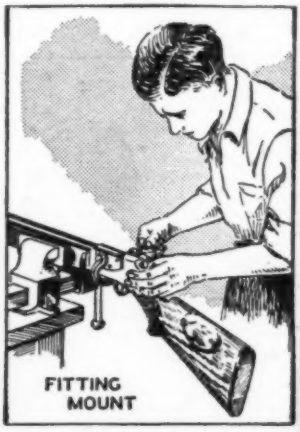
Since the modern hunting scope has both lateral and vertical adjustment of the crosshairs or post reticule, by means of outside screws, the problem of the mount designer has been greatly simplified; for his only concern is to secure a handsome, rigid means of attachment which will fulfill the other requirements mentioned above—he does not have to provide any elevation or horizontal adjustments in the mount.

I designed and built the mount shown to measure up to my ideal in a hunting scope mount, after using most of the other mounts on the market. The pilot model here shown was fitted to a Model 63 Winchester Automatic rifle, although it can be adapted to almost any type of arm. Its making and fitting is NOT beyond the ability of the careful amateur with his basement shop—or with the help of some friend who owns a machine shop.

The mount consists of only 10 parts, of which 5 are screws—the five remaining parts being, two identical bands to clamp the barrel of the scope; these are movably dovetailed

Sketch at right shows correct rifle clamping method. Left: Appearance of completed job.





FITTING MOUNT

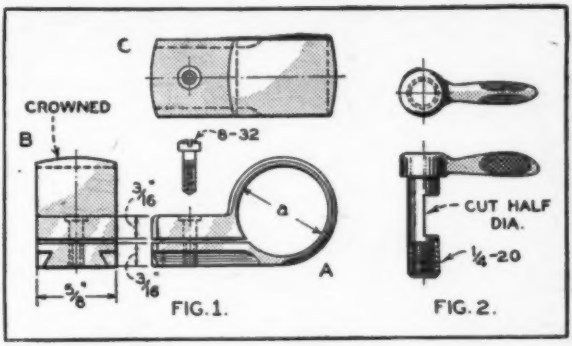
FOR YOUR RIFLE

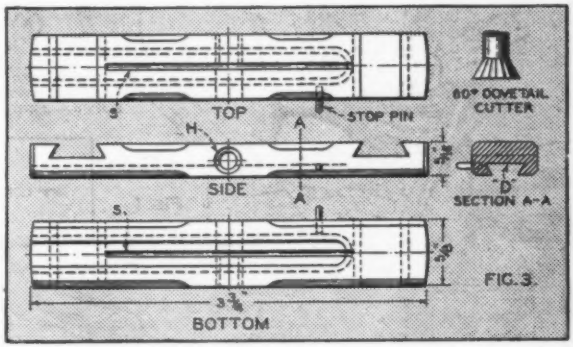
into removable base, which is clamped, by means of the lever screw to the side plate which is attached by means of screws to the receiver of the rifle.

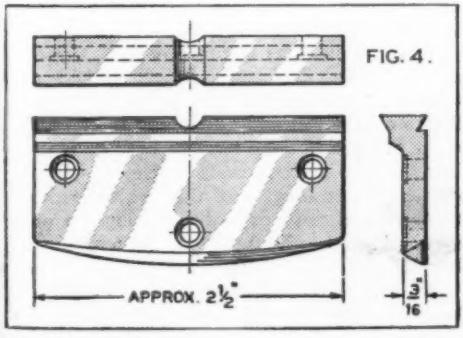
It sounds simple, and it is simple. But one thing is essential, and that is, very careful, accurate workmanship. The making of this mount will afford some intensely interesting hours of work, both at the machine and filing bench; it contains some of the most interesting exercises in file fitting that one could ask for; and if necessary, the entire job can be turned out largely by hand, with a minimum of machine operations. Few dimensions have been given, as these may be readily worked out according to the taste of the workman in matters of appearance, and varied as necessarily to suit the rifle and scope being fitted.

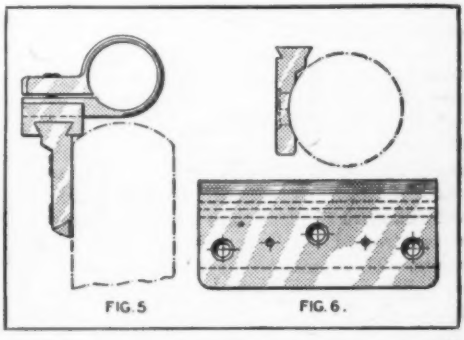
Before getting into details, study the sketch, Figure 5, which shows a rear view of the mount in place on a flat receiver such as that of the M. 63 Winchester and many other arms. The first essential, of course, is that the exact center of the scope bands coincide with a vertical line passing through the center of the receiver. Now study Figure 1, which shows (A) the rear view, (B) the side view, and (C) the top view of the telescope holding band. There are two of these, identical in size and form, and 5/8" in width seems to give the best appearance with adequate strength. In making these, two scraps of 5/8" thick cold rolled steel were soft soldered together, then chucked in the lathe and the large hole (a) Fig. 1, first drilled then carefully bored to exact size. This diameter "A" depends on the size of the scope barrel, which in most popular scopes is 3/4". Hole should be smoothly finished to a smooth push fit on scope—not more than .002" oversize, and with the sharp edges relieved to avoid scratching the scope.

While still held [*Continued on page* 172]



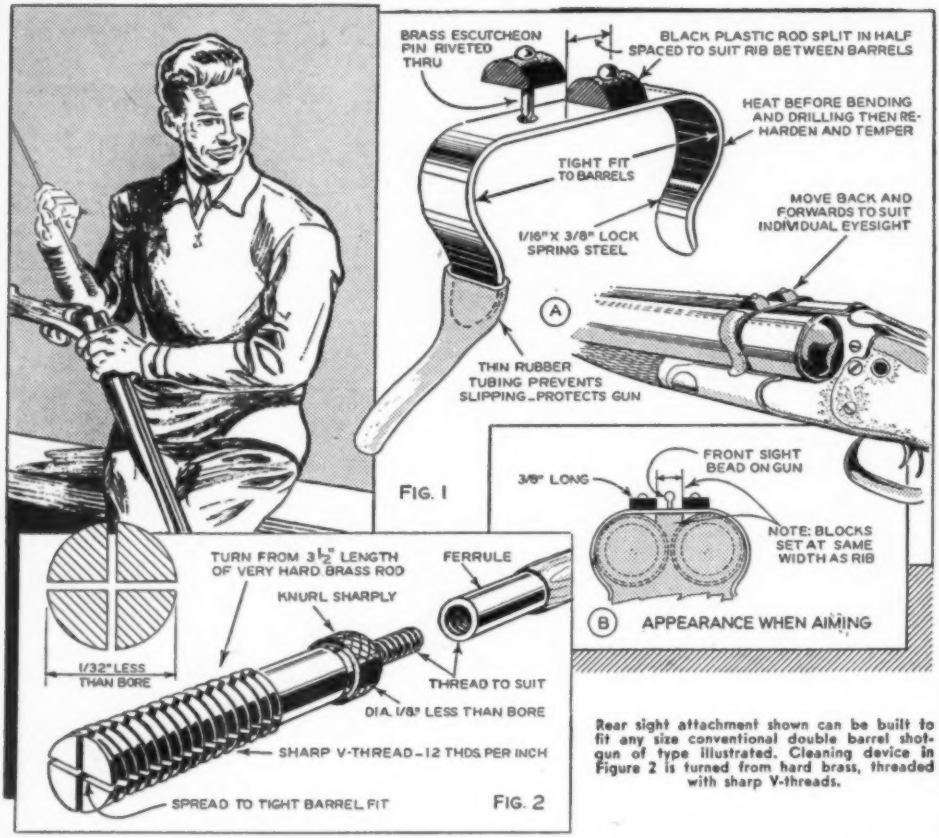






SHOTGUN ACCESSORIES

You'll score more hits and keep your gun in better shape with these.


BRASS ESCUTCHEON PIN RIVETED THRU
BLACK PLASTIC ROD SPLIT IN HALF SPACED TO SUIT RIB BETWEEN BARRELS
HEAT BEFORE BENDING AND DRILLING THEN RE-HARDEN AND TEMPER
TIGHT FIT TO BARRELS
MOVE BACK AND FORWARDS TO SUIT INDIVIDUAL EYESIGHT
1/16" X 3/8" LOCK SPRING STEEL
A
THIN RUBBER TUBING PREVENTS SLIPPING-PROTECTS GUN
FIG. 1
FRONT SIGHT BEAD ON GUN
3/8" LONG
NOTE: BLOCKS SET AT SAME WIDTH AS RIB
B APPEARANCE WHEN AIMING
TURN FROM 3½" LENGTH OF VERY HARD BRASS ROD
FERRULE
KNURL SHARPLY
1/32" LESS THAN BORE
THREAD TO SUIT
DIA. 1/8" LESS THAN BORE
SHARP V-THREAD-12 THDS. PER INCH
SPREAD TO TIGHT BARREL FIT
FIG. 2

Rear sight attachment shown can be built to fit any size conventional double barrel shotgun of type illustrated. Cleaning device in Figure 2 is turned from hard brass, threaded with sharp V-threads.

TWO desirable accessories for the scattergun user are shown herewith, Figure 1 being an easily made rear sight designed to prevent cross shooting and to improve speed and accuracy of aiming, on double guns.

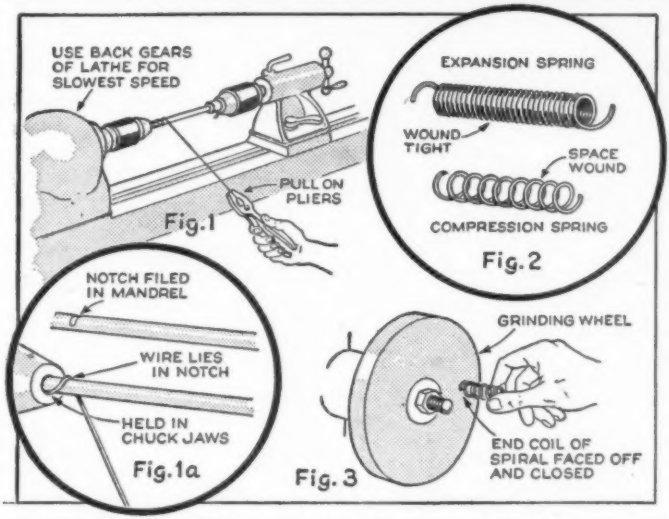
A piece of ordinary lock spring $\frac{3}{8}$" wide and $\frac{1}{16}$" thick is heated and bent as shown at A, Figure 1, to fit over rear end of barrels above forend. The exact position on barrels will be governed by the shooter's eyesight, and it should be moved back or forward until best definition is obtained. Two small blocks of black fibre or plastic are attached by means of two round head escutcheon pins used as rivets. These are half-round in shape, and may be cut from a piece of round stock. Rivets should be exactly centered in blocks, and heads allowed to stand above surface as shown, while the blocks should be spaced apart a distance equal to the width of rear end of the gun's barrel rib. The appearance when aiming is shown at B.

When spring has been bent to shape and rivet holes drilled (and before blocks are attached) it should be re-hardened by heating to cherry red and quenching in oil—then draw temper to dark blue in bath of melted lead, and quench in water. Before placing on gun, short lengths of thin walled rubber tubing are slipped over the two legs, to prevent slipping from position, or marring of barrels.

With this simple device the shooter quickly learns to center his [*Continued on page* 170]

Wind Small Springs as you need them

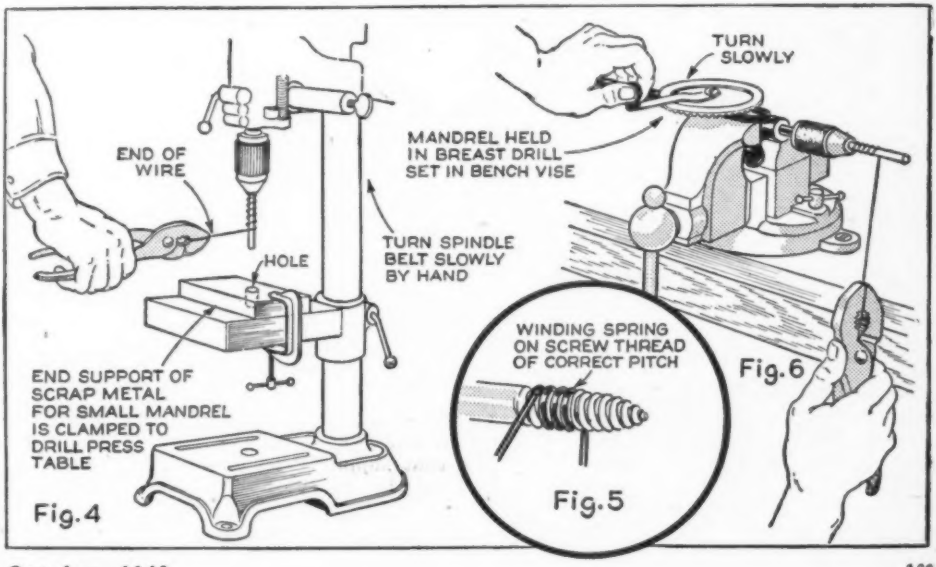
A workshop expert tells you how it's done.



by Clyde Baker, U.S.N.

GUNSMITHING, miniature trains, airplanes, model work and various other projects frequently call for small coil springs, ranging in size from 1/6" to ¼" or larger in diameter—and often not readily obtainable. Where only one or two springs in a given size are needed, they are easily made, either of steel music wire, brass or bronze wire as required, without special tools or special setup—particularly if you have any sort of lathe, though even a lathe is not essential.

In winding any coil spring it must be remembered that when the tension on wire is released, the spring will expand somewhat, making it larger than the mandrel on which it was wound. There can be no set rule for allowing for this, as the expansion varies both with the size of spring, hardness of wire used, and tension at which it is held. Consequently I've adopted the plan of allowing for about 20% to 25% expansion; and, since it takes but a few moments to wind a small spring, [*Continued on page* 162]


END OF WIRE
HOLE
END SUPPORT OF SCRAP METAL FOR SMALL MANDREL IS CLAMPED TO DRILL PRESS TABLE
Fig.4
TURN SLOWLY
MANDREL HELD IN BREAST DRILL SET IN BENCH VISE
TURN SPINDLE BELT SLOWLY BY HAND
Fig.6
WINDING SPRING ON SCREW THREAD OF CORRECT PITCH
Fig.5

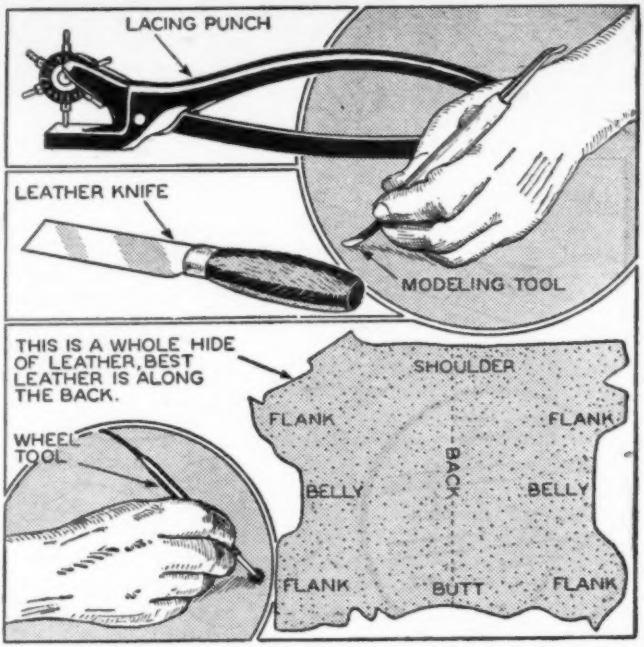
Leathercraft

[*Continued from page* 101]

can be purchased at about two dollars for a whole skin. Lacing varies in price according to its width, but the most commonly used is about five cents a yard. This all sets the price of an average-sized coin purse or key case at approximately forty cents. You can judge by these prices the cost of making other items. Small articles can be made from scrap leather for fifteen and twenty cents.

It is advisable to prepare your leather at least 24 hours in advance of tooling it. Soak the piece you are going to use in cool or tepid water for three minutes. This will soften the leather and make it easily workable. If it is wrapped in oil paper for the night, it will remain soft and pliable until you are ready to tool it.

First, select a pattern. For convenience, suppose you have decided to make a coin purse. Cut a piece of leather slightly larger than the pattern you want to use, and prepare as above. Place this piece smoothly on a board. Lay your pattern on the damp leather, and go over all the lines of the pattern with a pencil or tracing tool to make an impression on the leather. Use a ruler for all straight lines in order to produce a craftsmanlike article.



Illustrated above are some of the tools used in leather working, and a sample hide. Smaller pieces of leather can be obtained if desired, but buying a hide is most economical way. At right is suggested pattern for outside of a coin purse. This is the sort of simple job the beginner would be wise to start on.

A design is made to stand out by tooling. A pleasing effect is accomplished by raising with the modeling tool the body of the design from the back of the leather. The background may be embossed with either a deep impression or with dots, like stipling. After the design has been raised, use the modeling tool around the edges to give it a finished look.

If you purchased a natural leather you can use color in your designs. This is the most pleasing effect of all. Use a small water color brush and special aniline dyes, which may be obtained from leather companies. To prevent streaking, the leather must be wet while you are applying the dye. Dark leathers are tanned in such a way that they will not take dyes.

If you make a coin purse, you will want to line it. This is done with a special thin leather, called skiver. Cover the backs of the tooled piece with Sphinx paste, a gelatin adhesive, obtainable from

[*Continued on page* 158]

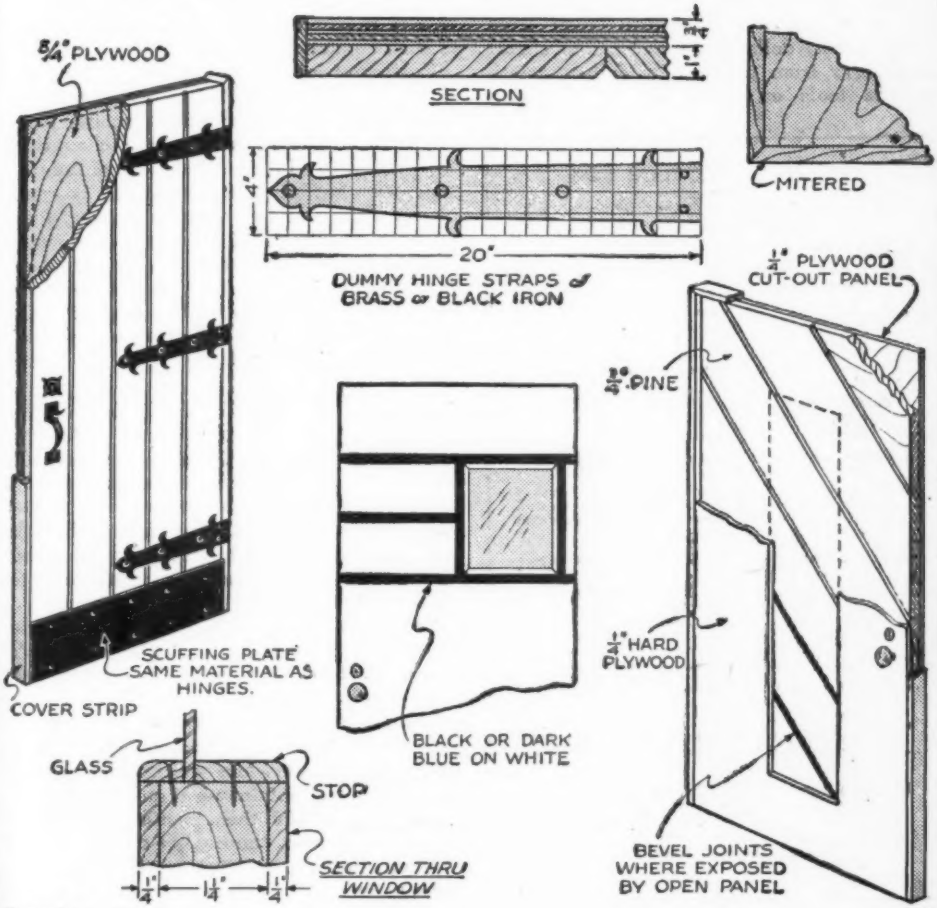
A NEW FRONT DOOR will Brighten your Home

ONE or another of these doors can be applied to almost any house of conventional design, and they are especially suitable to modern architecture.

At left, below, is a built-up job of planks with beveled edges secured to a back panel with finishing nails and casein glue, and bound with a covering strip around the edges. Dummy hinge straps are made of heavy black iron and a scuffing plate along the bottom of the same material. Use square head nails in the hinge straps.

The door at right is outdoor plywood over diagonal planking, the exposed edges of the latter beveled. The vee-joint thus formed is painted dark blue to emphasize the lines.

A typically modernistic note is achieved in the center sketch with the horizontal stripping, and window placed on one side. Construction is illustrated in the sectional view.



THE SCHOOL SHOP

Conducted by Frank Petraglia,

Shop Instructor, Samuel Gompers Industrial High School
New York City

Keep Your Tools And Machines Free From Rust!

THE finer a piece of tool steel, as a rule, the more susceptible it is to rust. The high carbon content of micrometers, verniers, and other precision instruments, scales, slide calipers, and similar tools often carried in the pocket while on the job, is a constant source of rust.

Rust is destructive, and good tools cost money. A 6-inch scale in good standard make will cost around a dollar; a slide caliper close to five dollars; and a good "Mike" from ten to twenty dollars. An average mechanic may carry from ten to fifty dollars' worth of fine tools on his person; and bodily warmth, shop humidity and perspiration may quickly cause considerable damage and loss.

The cast iron tables of various saws, jointers, shapers and mills, as well as lathe beds, are equally liable to rust from contact with sweaty hands and arms; so are the ball cranks and hand wheels of such machines. Nothing looks sloppier or more un-workmanlike, than to see such parts coated with red rust . . . which, in a short time, will greatly impair both the value and efficiency of such equipment.

Rusting of small tools and machinery parts may be largely prevented by the exercise of a little care. All tools and machine parts regularly subjected to handling should be wiped off with a little oil at the end of the run. When rust has barely started it may be completely eliminated by rubbing with very light oil on a small pad of very fine steel wool. This will not scratch, and is very useful on graduated sleeves of slide rests, scales, and other parts. Machine oil is fairly good for the purpose, but the following easily prepared compound is much better:

Amyl Acetate	4 oz.
Acetone	4 oz.
Medium motor oil	2 oz.

Dissolve the oil in the acetone, then add the amyl acetate and shake thoroughly. (Incidentally, this is one of the finest cleaning compounds ever known for rifle barrels after shooting, and is practically identical with a famous cleaner sold for many years to riflemen.)

Small tools carried on the person should be carefully inspected at the end of each day's job, and wiped off thoroughly with this or some other suitable oil.

For preventing rust on tools to be put away for a time, plain white vaseline is very good; but a mixture of white vaseline and anhydrous lanoline (obtainable at any drug store) is much better. Melt them together over a water bath, and mix thoroughly while cooling.

A still better protective agent for tools in storage is: [*Continued on page* 166]

STUDENTS' PROBLEM BOX

1. Q. Can you tell me what makes a satisfactory solution for plating with pure 24-carat gold?—*F. W.*

   A. A commonly used solution consists of: gold chloride, ¼ oz., sodium cyanide 1¼ oz., and sodium bisulphite, ¼ oz., dissolved in 32 oz. distilled water.

2. Q. I have found that when using fine steel wool to rub down shellac or other finishing materials, the fine particles embed themselves in the surface and make removal a difficult and tedious job. Is there some easy way to overcome this trouble?—*C. J.*

   A. After brushing out all the particles which come loose easily, run a strong magnet over the surface. This is very effective.

3. Q. How can tough, Monel metal be drilled without burning the end of the drill bit?—*B. K. R.*

   A. When drilling any tough sheet metal, punch a small hole through it first, and then use the drill bit to enlarge the hole to size. Use a slow drill speed and oil as a lubricant.

4. Q. Is there a special nail which is used for driving into mortar?—*R. N.*

   A. It is safe to say that a special nail exists for almost every special purpose. The special mortar nail is shaped like a screw with heavy, wide threads and flat top. When hammered into mortar, just as you drive an ordinary nail into wood, it turns in and wedges itself tightly.

5. Q. Is it a fact that a soft lead pencil, rubbed over the moving parts of a stapler, "lubricates" the stapler?—*D. B.*

   A. Yes. The graphite in the lead provides a good lubricant, and it does not soil papers and hands like a liquid lubricant.

6. Q. Can some kind of roller be attached to the ends of a ladder to prevent the ladder from catching on the siding of a wall?—*F. H. B.*

   A. It is better to use ½ in. flat iron bolted to the ladder ends. The irons should be rounded over the ends.

Books For Your Home Workshop Library

Good books are an indispensable part of any home workshop. In a very real sense they are tools. Here is a list of books which will serve as an effective working library and foundation for future additions. Each of the following titles is recommended for its interesting presentation of subject and not too technical treatment.

PRACTICAL ELECTRICITY by Terrell Croft. McGraw Hill Co.

PRINCIPLES OF RADIO by Keith Henney. John Wiley & Sons.

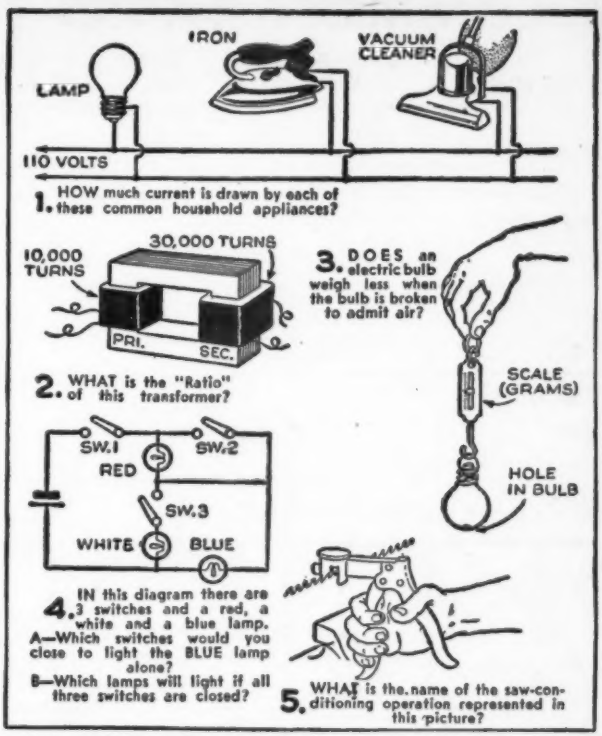
ENCYCLOPEDIA OF MACHINE SHOP PRACTICE by G. W. Barnell. Wise & Co.

BOYS' BOOK OF REMARKABLE MACHINERY by E. Hawks. Dodd Mead Co.

FIRST BOOK OF AVIATION by Alexander Klemin. Coward McCann Co.

PRINCIPLES OF WOODWORKING by Herman Hjorth. Bruce Pub. Co.

WOODWORKING AS A HOBBY by Emanuele Stieri. Harper & Bros.


IRON
VACUUM CLEANER
LAMP
110 VOLTS
1. HOW much current is drawn by each of these common household appliances?
30,000 TURNS
10,000 TURNS
PRI.
SEC.
2. WHAT is the "Ratio" of this transformer?
3. DOES an electric bulb weigh less when the bulb is broken to admit air?
SCALE (GRAMS)
HOLE IN BULB
SW.1
SW.2
RED
SW.3
WHITE
BLUE
4. IN this diagram there are 3 switches and a red, a white and a blue lamp.
A—Which switches would you close to light the BLUE lamp alone?
B—Which lamps will light if all three switches are closed?
5. WHAT is the name of the saw-conditioning operation represented in this picture?

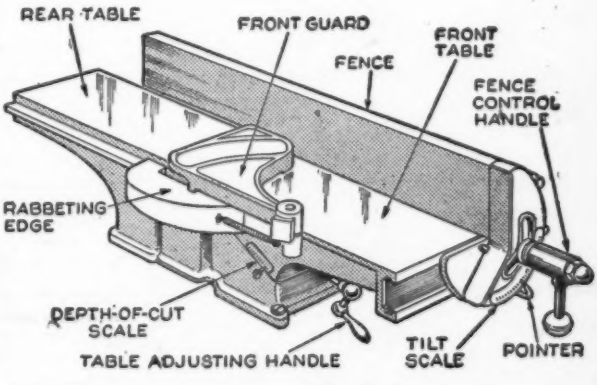
HOW MANY OF THESE ELECTRICAL AND SHOP QUESTIONS CAN YOU ANSWER? Rate 20 for each correct answer. A score of 60 is passing; 80, very good; 100—well that would be just too, too wonderful. Turn to page 176 for checkup.

MI Shop Scrapbook Information Sheet

The Jointer

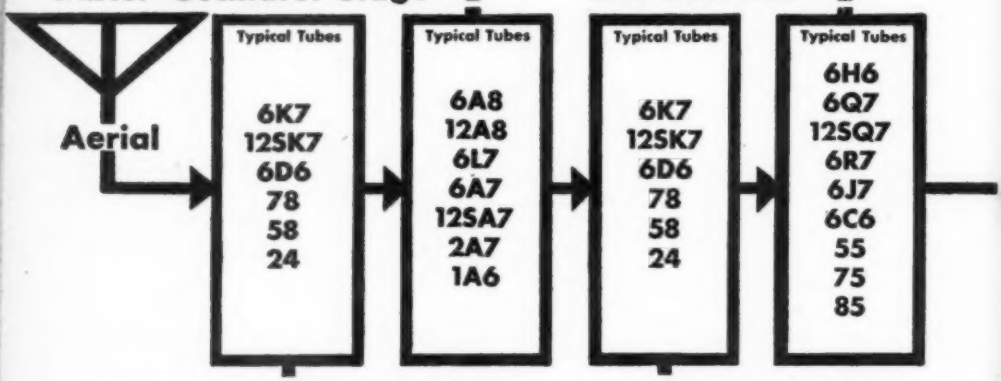
ONE of the most useful machine tools a man can have in his home workshop is a Jointer. Moderate in cost, a 6-inch Jointer will perform a great variety of woodworking operations, and is heavy enough for the average shop. Used in connection with a circular saw it provides virtually a two-unit small-sized lumber mill. The "business end" of a jointer consists of a cutterhead holding three high-speed steel knives. The cutterhead operates between two tables, both adjustable for depth of cut. A tilting guide fence is provided for easy and accurate feeding of the work to the cutters, which rotate at speeds of from 4,000 to 8,000 r. p. m. A ½ h. p. motor turning 1,750 r. p. m. is sufficient to drive a 6-inch Jointer, pulleys being used to obtain the necessary shaft speed.

Besides jointing (don't confuse this term with dovetailing, etc.; it's really like planing) this tool can do surfacing work, rabbeting, beveling, tenoning, chamfering, tapering, and cutting mouldings of various types.



COMMON RADIO TROUBLES STAGE-BY-STAGE

SYMPTOMS	Mixer-Oscillator Stage	2nd Detector
Inoperative	Oscillator plate resistor open First I. F. transformer primary open Shorting or open oscillator trimmer condenser Open plate choke coil	Plate load resistor open or shorted Shorted trimmer condenser Control grid lead shortening to shield Open plate filter choke
Intermittent Fading	Poor insulation on oscillator trimmer condenser Open grid return resistor High resistance at lugs of oscillator coil Dirty band switch contacts	Defective volume control Load resistor bypass condenser shorting High resistance contact in I. F. transformer secondary R. F. bypass condenser shorting
Oscillation or Noisy	Open grid coil Cathode bypass condenser open or leaky Shield on grid leads corroded or open Decoupling resistor shorted	Open plate or grid bypass condenser Defective volume control Out of alignment Defective plate load resistor
Distortion or Hum	Leaky plate bypass condenser Shorted or leaky cathode bypass condenser Open grid filter condenser Oscillator coil misaligned	Defective volume control Leaky audio coupling resistor Plate load resistor too high Leaky plate bypass condenser



R. F. Stage — I. F. Stage

SYMPTOMS	R. F. Stage	I. F. Stage
Inoperative	Open or shorted R.F. coil Band switch contacts dirty Shorted tuning or trimmer condenser Open plate decoupling resistor or choke	Open I. F. coil Plate decoupling resistor open Shorted trimmer condenser Primary or secondary bypass condenser shorted
Intermittent Fading	Shorting trimmer condenser Loose connecting lugs on R.F. coil Leaky plate or screen bypass condenser Band switch making poor contact	Open or shorting grid bypass condenser Litz wire on lugs corroded Trimmer condenser shorting A.V.C. network defective
Oscillation or Noisy	Rotor contacts on tuning condenser dirty Open cathode or screen bypass condenser Shorted bias resistor Aligned too sharply	Screen bypass condenser open I. F. transformer out of alignment Shorted cathode bias resistor Poor coil contacts at lugs
Distortion or Hum	Shorted filament bypass condenser Antenna too long, causing overload Shielding making poor contact Shorted antenna coupling condenser	Open cathode bypass condenser Stage out of alignment Too sharply tuned oscillation High resistance between primary and secondary of I. F. transformer

With the growing scarcity of radio servicemen, you may find it necessary to trace down and cure the troubles in your own set. This handy "trouble-shooting" chart will help you do so.

The first move in tracing trouble is to have all tubes tested. *After* they have been eliminated as the possible cause of the trouble is the time to give thought to the parts in the receiver.

The common symptoms are listed at the left of the chart, and the probable difficulties for each individual stage listed to the right—each stage in the receiver being represented by a block in which is listed the tube types commonly associated with that stage.

Shorted electrolytic condenser in power supply	Open voice coil
Power supply filter choke open	Secondary of output transformer open
Open voltage divider in power supply	Voice coil leads open
Shorted or open power transformer secondary	Voice coil leads shorted to pole piece
Shorted or leaky filter condenser	Voice coil lugs making poor contact
Loose contacts on voltage divider	Metal filings grounding voice coil
Defective line switch	Secondary of output transformer opening
Filter choke shorting to ground	Field coil connections making poor contact
Open filter condenser	Metal filings grounded voice coil
Defective voltage divider	Warped cone
Filter choke leaking to ground	Voice coil rubbing on pole piece
Leaky bypass condenser from rectifier tube to ground	Voice coil winding loose
Open or shorted primary bypass condenser	Field coil open or shorting
Centertap on filament windings open	Hum bucking coil shorted or reversed
Open or leaky output filter condenser	Voice coil rubbing on pole piece
Grounded pilot light bracket	Unfiltered field supply

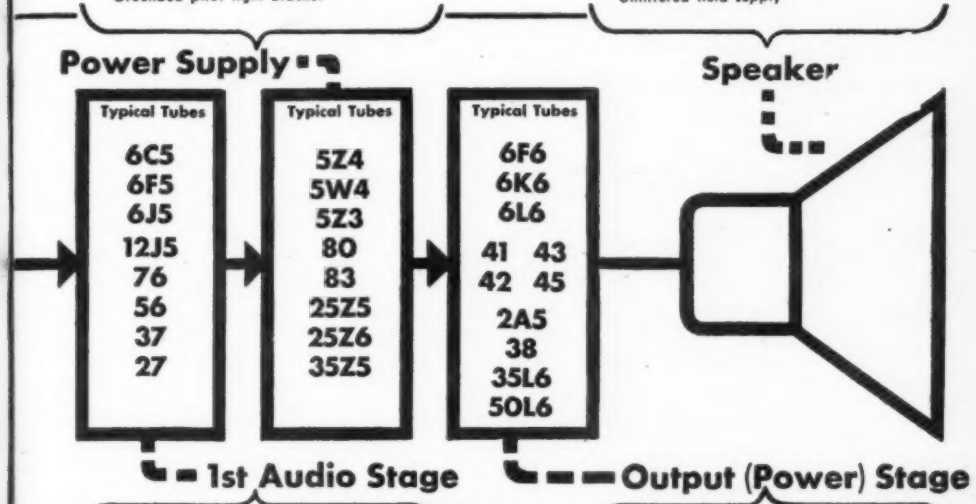
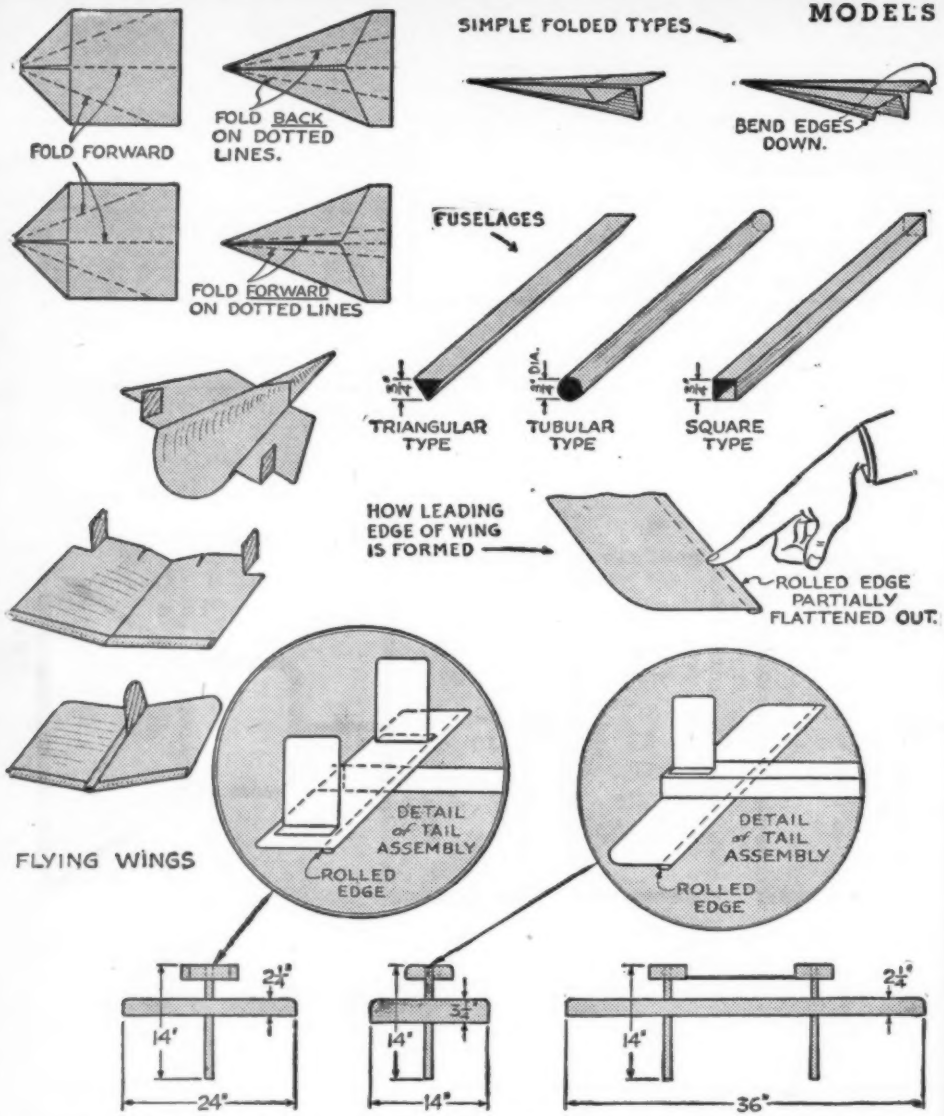


Plate load resistor open	Primary of output transformer open
Open audio coupling condenser	Open cathode bias resistor
Shorted plate bypass condenser	Shorted audio coupling condenser
Open cathode resistor	Secondary of output transformer shorted or open
Defective audio transformer primary	Defective primary on output transformer
Open volume control	Open cathode bias resistor
Leaky grid or plate coupling condenser	Shorting audio coupling condenser
Defective plate load resistor	Open secondary on input transformer
Shorted cathode bypass condenser	Open cathode bypass condenser
Plate decoupling resistor shorted	Defective cathode resistor
Open plate bypass condenser	Leaky audio coupling condenser
Primary of coupling transformer opening	High resistance from primary to secondary
Shorted grid or plate coupling condenser	Shorted cathode bypass condenser
Cathode bypass condenser shorted	Screen grid circuit open
Audio transformer open or shorting	Shorted turns on output transformer
High resistance from primary to secondary of audio transformer	If pushpull tubes may be unbalanced



Above are details for making the various types of Flollyslods described in the text and illustrated photographically on page 112. Where extra strength is needed in the wings, a soda straw can be inserted in the rolled leading edge.

Waggery Through Air Power

[*Continued from page* 112]

wind direction without resorting to instruments, or even paper and pencil.

While the average man would probably not care to pursue the science of Flollyslods to this extent, there is no reason why he cannot attain to a certain degree of expertness in both building and flying these interesting gadgets, which mean so much to the future of mankind. In time he may, if somewhat above average intelligence, even be able to design a Flollyslod of his own, though he would naturally have to be content with slightly primitive or crude results, since he couldn't hope to compete with men who have devoted their lives to the subject. [*Continued on page* 168]

Turn Your Hobby Into Cash

[*Continued from page* 51]

lucrative job as a professional contest judge!

Painting faces on eggs is a hobby popular with many people; but Graham Dale went farther than that—he made what he called "Egg-a-toons" (egg portraits) using actual photographs from which to copy. Then he goes realistic, using real hair for hair, and if the subject wears glasses, the egg is fitted with a tiny pair. He tries to select eggs shaped like the subject's face. When the egg portrait is finished it is mounted on a small, colorful base. Started as a hobby, purely for amusement, Mr. Dale now has a collection of over fifty egg portraits which he rents out as a unit to department stores and theaters for display purposes. He also makes them to sell as souvenirs and gifts.

John M. Cz of Madison, Ohio, had a hobby as unusual as his name: he grew pumpkins in the shape of faces. He did this by putting a mould over the pumpkin when it was very small, then as the pumpkin grew it would take the shape of the mould. He made the moulds himself and got some remarkable likenesses. One day he happened to show some of his work to a florist. The florist asked to display them in his store window during the Thanksgiving season and they made such a hit that he asked Mr. Cz to grow some special ones for October, in time for Hallowe'en. Now Mr. Cz's pumpkin faces are being ordered by florists throughout the country for window displays.

An eighteen-year-old girl in Cleveland Heights, Ohio, Nancy Forbush, started her hobby of making marionettes and putting on shows with them when she was eleven years old. As her skill increased she would give performances for children in hospitals and orphanages. She did so well that she kept getting calls to put on her little shows commercially at theaters, clubs and private parties. Her hobby finally brought her to the White House where she put on a performance.

As a boy E. Ross Allen had snakes for a hobby. Fifteen years ago he settled in Florida and in his spare time he would capture snakes to study the individual characteristics of the various species. While following this hobby he learned that snake venom was valuable medicinally. He soon found he could extract the venom from snakes and sell it to a pharmaceutical laboratory. Today Mr. Allen has a snake farm that supplies most of the snake venom we use medicinally. It's still a hobby, but now it pays cash dividends.

Howard Klein of Philadelphia, a printer, studied hypnotism as a hobby. He learned to hypnotise not just one person but a dozen at a time. He puts them "under" then makes them do a variety of funny things. He hands one subject a lemon, for instance, tells him it is a juicy peach and suggests he start eating it. The subject takes a bite and Mr. Klein asks him if it is good. The subject says it's delicious—and Mr. Klein suggests he take another bite, which he does. Then Mr. Klein tells him it's a lemon whereupon the subject, very disgusted, throws the lemon on the floor and tries to get the sour taste from his mouth. He has another subject sell

[*Cont. on page* 155]

LOOKING FOR A HOBBY
TO TURN INTO CASH?

MECHANIX ILLUSTRATED describes, pictures, and diagrams them all the time. For example, "Leathercraft is a Profitable Hobby" on page 100 of this issue. Benefit from the experience of a leatherworker who has obtained fun and cash from a swell avocation. Look for other cashable hobbies in forthcoming issues of MI!

Peacetime Automobile

[*Continued from page* 45]

will be of tubular design. Ford is working along these lines, among others.

You're itching to get a glimpse of the power plant of your new dream car, but you aren't sure whether to look for it in front or rear. Neither are engineers, right now. Some insist that the engine belongs in the rear over the axle, eliminating long driveshafts and keeping heat and fumes away from passengers. Others believe that the weight of the engine in front makes for better controllability. Practically, this means that you can take your choice: some makers will put the motor in front, others in the rear.

Wherever it's located, you're in for a shock when you first see that engine. It looks like a magnified toy, about big enough for an oversize motorcycle. If it is mounted in the rear, the cylinder block will run parallel with the axle, rather than lengthwise. Saving in space will be as much as 25 percent, which will make your car living-room more spacious.

Don't sneer at that compact little cyclone! Designs for it are on the drafting-boards of motor companies right now. It's tiny but it's high-compression, high-speed, and uses high-octane (anti-knock) gasoline. It will out-perform your present motor as a greyhound pulls away from a St. Bernard. And for all its volcano of power, this little engine will deliver about 30 miles per gallon.

[*Continued on page* 148]

Peacetime Automobile

[*Continued from page* 147]

An example of the progress that has been made in designing: One airplane engine that in 1939 developed 1,000 H. P. now develops 2,100 H. P.!

Airplanes and tanks have taught engineers how to deliver terrific power in a small package. It's no secret. Burn a little gunpowder in open air and nothing much happens. Confine the powder in a stout wrapper, ignite it, and you have a firecracker that goes off with a terrific bang. It's much the same with gasoline vapor, compressed and ignited in a cylinder. The more it's compressed, the more power delivered per explosion. Practical limits to this compression are being lifted by several developments.

For one thing, the use of beryllium and other alloys makes possible light cylinder heads which can resist forces unimaginably great. That reduces the weight-to-power ratio. (see "Beralite Will Bomb Berlin," MECHANIX ILLUSTRATED, September, 1942.) The second great factor is the perfecting of new fuels.

"A fuel many times more powerful than gasoline has been produced, which will require entirely new automobile engines because present designs are not able to use it," Frank W. Curtis, President of the Van Norman Machine Tool Company, recently told members of the American Society of Tool Engineers. "This fuel is of a very high compression type that will require a small, high-speed motor with a greater power per pound of weight than present motors."

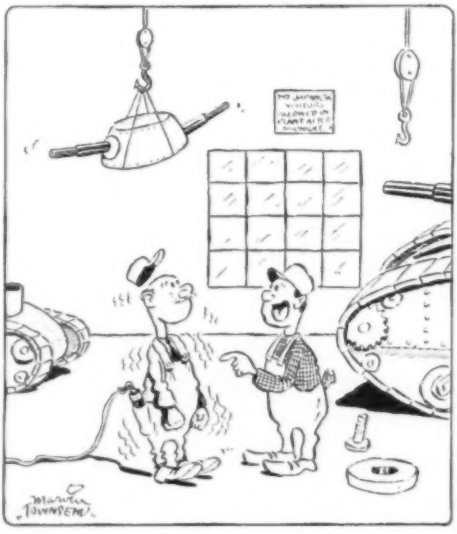
Gasoline as it now comes out of the filling station hose is very different from the stuff we're going to get. When fuel "knocks" in your motor it is not operating efficiently. Reduce the knock-point and you are able to step up compressions, get greater power. "Octane rating" is a chemical yardstick designating anti-knock properties; 100-octane gas is 100 percent anti-knock. The "low"-test fuel of tomorrow will be about 80-octane; high-test, 100-octane. You will be using gasoline of the type that now drives fighting planes.

All the big oil companies are turning out immense quantities of high-octane gas for military use. With peace here, this producing capacity will be available to motor car owners and they'll need new engines to use it. Phillips Petroleum has several refineries producing 100-octane fuel by a polymerization process—which means, essentially, that certain molecules from petroleum, formerly wasted, are forced by heating and squeezing to form bigger chains of molecules; i. e., high-octane gasoline. It is estimated that if such a process were universally used we would have an extra billion gallons of gas a year from the same amount of crude—all of it better fuel. The Shell Oil Company has recently developed a new synthetic for use in blending high-octane gasoline.

Even more startling is a process just patented by the Texas Company. They take two common gases—carbon monoxide and hydrogen—and bring them together in the presence of a catalyst which converts them to a mixture of hydrocarbons, readily refinable into high-octane fuel. Carbon monoxide is abundant; it pours wastefully from your auto exhaust and is present in illuminating gas. Hydrogen is as plentiful as water. Here is a preview of the day when your gasoline will come not from oil wells but from natural gases.

Chemists, in fact, worry less about future fuel supplies than you do. Charles F. Kettering, General Motors research head, foresees the day when we will grow all the fuel we need because, as he says, "all the fuel we now have has been grown"—coal, petroleum and the like being captured forms of sun-energy. He predicts a day when motor cars will be powered by radio or some other means of tapping sun-energy direct.

Far less remote is the probability that we will soon grow part of our fuel in the form of corn, wheat, potatoes, weeds, or anything else fermentable. Alcohol-gasoline blends have long been used successfully in Europe, notably in Nazi planes. In our own country such blends have been widely marketed as fuels through farmers' co-operatives in the Middle West. Usually a 10 percent alcohol mixture is advocated, but in England a fuel claimed to be "the most perfect yet" is one-third alcohol, two-thirds gasoline.



"No wonder you've acted so nervous all day—you forgot to turn off your rivet gun!"

Peacetime Automobile

That alcohol is a potent fuel is seen in the words of Dr. William Hale, one of the world's foremost organic chemists, who astounded petroleum engineers by telling them that at the instant of explosion in a cylinder, gasoline is actually a form of alcohol! The principal difficulty is to produce it cheaply, but many chemists believe it economically feasible, particularly since alcohol as a source of synthetic rubber is of vast current importance.

All these fuel developments will, as we have seen, be reflected in smaller, more powerful high-compression motors for your future car. Nor is the possibility that at least some of these motors will be air-cooled to be overlooked. Such motors may be looked for most logically in the cars which airplane manufacturers will produce.

Diesel engines, which certainly will dominate the field of truck and bus transportation, may also appear in automobiles, although their higher first cost is a present handicap. Since Pearl Harbor, one of the biggest motormakers has stepped up the horsepower of its small Diesel 40 percent, with no increase in size. But the most astonishing discovery is the fact that when ordinary gasoline is used as fuel in this motor, *one-third more miles per gallon are obtained than the same fuel would deliver in a gasoline engine.*

Here we are on the threshold of something truly revolutionary: a *solid-injection* gasoline motor, operating on Diesel principles. A measured quantity of gasoline (not vaporized or carbureted) injected into the cylinder is exploded by the heat of compression as the piston squeezes it against the cylinder head. This eliminates carburetor and spark plugs and gives more miles per gallon with greater efficiency. Some Nazi planes are now powered with such engines.

Military planes derive part of their terrifying speed from superchargers supplying air under pressure to mix gasoline into explosive vapor. Lessons learned from such designs indicate that you will be able to specify supercharging equipment for your future car if you want greater flexibility and power.

Lubricants will also be very different. Says Edward G. Seubert, President of the Standard Oil Company of Indiana, in a letter to MECHANIX ILLUSTRATED: "We had expected to announce to the public this spring a new motor oil which is so far ahead of the old in severity of service conditions it will satisfy that there is hardly any use considering the two in the same classification. War developments obliged us to defer the announcement. I hope that when peace comes we can offer that oil or something still better, and with it motor fuels which will give to motoring some of the same efficiency in use of power that is characteristic today of operation of military planes."

Perhaps you will never have to change your crankcase oil from season to season but merely keep it filled to proper level. Tanks and jeeps, which must be kept rolling under gruelling conditions, are the test tubes here. A tendency of high-octane gasoline to cause formation of gum in engines has already been overcome by chemicals developed by Monsanto and other companies.

Manual gear-shifting will be out, of course. Gears will be shifted electrically or hydraulically. The car will have automatic transmission and hydraulic drive. Quite probably it will also have optional four-wheel drive—when you get into tough going on hills, snowy roads or in sand, pull out a lever on the instrument board and the power of the motor is instantly transmitted to all four wheels. Jeeps now have such a contrivance, and as we all know, jeeps are in mass production.

Another possibility which has been suggested by competent authorities is an application of the Chrysler "fluid drive" principle directly to the four wheels of the car. Separate "fluid drive" units applied directly to each wheel individually would eliminate differential and gear shifting and would have a number of other advantages.

Perhaps the most sensational development which may come out of wartime research is a new application of steam power to automobiles. Amazing improvements in the efficiency of the steam engine have been made in recent months (see "Full Steam for America," MECHANIX ILLUSTRATED, May, 1942). J. T. McTarnahan, co-director of the LaMont Boiler System, foresees a definite possibility of developing turbo-electric motors for automobiles after the war. There has been a suggestion that such cars might operate in this manner: A booster steam engine capable of flash performance (such engines are now in operation on the newest destroyers) would generate electricity, which would in turn run our electric motors each powering a wheel of the automobile.

Prepare for further surprises in the field of [*Continued on page* 150]

THE WORLD'S 10 MOST NEEDED INVENTIONS!

Do you want to be an inventor? Then read this fascinating article by Raymond F. Yates, author of the forthcoming book, "2100 Needed Inventions." He tells you in detail the 10 things most needed by the world of today—10 keys to fortune, if you have an inventive mind! Read it in the big November *Mechanix Illustrated.*

Peacetime Automobile

[*Continued from page 149*]

accessories and equipment. Air-conditioning units will probably be standard for cars, as they will be for new homes. Since the car seats will be removable or collapsible, leaving a good-sized air-conditioned room with a perfectly flat floor, the car can easily become a portable bedroom.

Several probabilities loom for headlights. One is that the lamps will throw narrow horizontal beams, brilliantly illuminating the road but not reaching high enough to glare into the eyes of oncoming drivers. These may develop out of a signal lamp now made by Westinghouse. For use on Navy vessels and convoy ships, it throws a beam whose rays are so narrowly controlled that they cannot be seen by an aviator flying directly above, although brightly visible on the ship to which they are directed.

Polarizing lenses for headlamps, long talked-of, may come into their own. Under the trade name of Polaroid, such lenses are familiar to most of us in glare-eliminating sunglasses and camera accessories. Polarizing films permit light to pass through them only in a single plane. Thus, light from a polarizing headlamp, when viewed through a similar screen in the windshield of an approaching car, is permanently robbed of glare.

An objection has been that about three times as much light is required for equal illumination through polarizing screens. But another Westinghouse development promises to answer the demand for more power to operate such lights, air conditioners, and other electrical equipment on tomorrow's cars. For airplane use, this company is turning out a generator which, although less than twice the size of present auto generators, develops 35 times as much power!

Another objection to present polarizing films is that they absorb heat and become very hot. The answer to this may be contained in a new patent issued to the Polaroid company for screens making use of fine longitudinal wires. Metal is, of course, an efficient heat conductor.

As in airplanes, your car may have seats equipped with safety belts. Most injuries to passengers result from their being hurled forward in collisions. Auto radios will be free from interference—no more disturbing crackles from electric charges built up within the body. . Simply dust into the tires a neutralizing powder developed by U. S. Rubber Company.

Instead of an ordinary strip of white paint along the center of the highway, this safety signal will no doubt contain phosphorescing pigments that are now readily available. During the daytime enough energy is absorbed to make them glow brightly all night long. Similar paints can be used to warn of bridges and other obstacles.

Easy-riding qualities of your car may, however, make you independent of highways if need arises. Tanks now fighting on the battle-fronts are equipped with "wobble plates"— gun mounts that remain on even keel regardless of how crazily the tank tilts and twists. It is perfectly possible to apply such a principle to the floor of your car living-room.

Wheels of your car are going to be somewhat smaller, for easier parking and steering. Reduction in size will also permit the front wheels to be enclosed within the body, like the rear wheels. Tires will be of synthetic rubber with certain amounts of natural rubber mixed in—but the total rubber content may be less than you expect, through use of such materials as fibers of spun glass.

Says Harold Boeschenstein, President of Owens-Corning Fiberglas Corporation:

"Looking a few years ahead, Fiberglas might even be a factor in permanently reducing the amount of rubber in tires. Further research and development may make glass textile fibers available for tire cord. Glass cannot replace rubber, but a tire fabric of Fiberglass, because of its high tensile strength and heat-resisting qualities, would reduce the amount of rubber required."

Another device which promises to increase the life of tires and improve ridability is changed design of wheel and rim called "air float tires" by the manufacturer. The conventional rim is widened and flattened, so that the clincher edges of the tire carcass are farther apart. Thus a 6-inch diameter tire becomes about 7½ inches in cross section. It is claimed that this makes for easier riding (air pressure is reduced about one-third), longer tire life, complete absence of shimmy and resistance to blowouts and punctures by relieving strain on sidewalls.

C. B. Woodworth of the Woodworth Spe-

cialties Company says of the air-float tire that it "is so great an improvement over old type pneumatic tires that it will undoubtedly be adopted for all classes of pneumatic-tired vehicles after the war. It not only rides easier, runs easier, wears much longer and is easy to handle, but it makes the car hold the road at speed even in the case of a very light vehicle and so will make the ordinary light automobile much safer."

Most secret of all war inventions—so secret that engineers squirm unhappily because they want to tell you all about them but are sworn to secrecy—involve advances in radio-controlled devices. You'll know why they're secret when you understand that these devices detect planes two hundred miles away, enable high-flyers to shoot down enemies they can't see, strike through depths of water to discover lurking submarines.

Many of the strange gadgets that will appear on your instrument panel sooner or later will control radio, microwave and electronic devices.

Suppose you are driving through fog on a dark highway. Even your powerful headlamps won't penetrate it. But suddenly, under your steering wheel, a red light comes alive. Invisible rays sent forward from your car have encountered an object ahead of you and flashed back a warning. A collision averted!

You're driving through a city or on a busy highway. There are no traffic signals at the corners. But as you approach a busy intersection, a light under your windshield glows red. You stop. It turns amber, then green, and you start again.

The signals come from miniature broadcasting stations which control traffic. You carry your own stop-and-go sign in the car and it is activated by the central broadcasting system. If a car is racing in to dash across your path at a blind crossroads, a red signal warns you in time—just as he is warned of your approach by rays from your car. If you want to pass a car going your way on the road, you touch a button and project a visual or audible signal that warns "I'm going to pass you."

Maybe you're taking a longer trip—New York to Chicago, say. Fine! You set your receiver on the Chicago wavelength and ride in on the beam just as airplane pilots do. No chance of taking a wrong turn or getting directions mixed up. No stopping to consult road maps. When you arrive in the outskirts, if you want to arrive at a certain building, you reset your receiver to tune in, say, 500 Michigan Boulevard, and you make all the proper turns and pull right up in front of the entrance.

You should, to be accurate, think of future cars rather than *a* future car. In recent years car models of different makers have had only minor points of difference.

Tomorow, though, there will be real distinctions—opportunities for many variations of design and material. If you don't want a plastic car you can have a magnesium one. If you don't want the motor at the rear you can have it in front. There will be mass production of several designs.

No single design as yet is frozen. Engineers keep abreast of breakneck developments and seize upon each new advance that is adaptable to motor cars. Some few cars, right after the war may be produced along 1942 lines, but this is more doubtful as time goes on, for already many of the dies that produced those cars have been scrapped. The view of manufacturers is, "Let's junk the old tools—competition will force us to give 'em brand new products after the war anyhow." At the lowest estimate, it will take six months to re-establish production lines, and engineers figure that will be plenty of time to polish off refinements on the ideas we have given you.

Does it look like $700 worth of car to you?

WANT TO FIND A GOLD MINE?

Sure you do. Who doesn't?

Then take heed of the real clues to *eight* bonanzas provided by the finder of a lost gold mine like that described in MI's recent amazing article "Found—the Key to the World's Richest Gold Mine." Barry Storm (above) in November's issue tells how he's spent five years unraveling the treasure trails in Arizona's fabulous Superstition Mountains.

I Filmed The World At War

[*Continued from page 57*]

reaches Sidi Barrani, along the coast road from Alexandria and Mersah Matruh. From here, except for the half-finished Italian stone road, he has to plow through miles and miles of soft shifting sand that is churned up into voluminous orange clouds that penetrate the interior of every type of case or container. Many's the night that I have taken out my camera-case from its tight-enveloping blanket, taken the camera from inside its case and from its surrounding flannel covering, and then opened the camera itself, only to find those abrasive granules of sand clinging, in vicious contempt, round the surfaces of the sensitive film-gate! A "Khamseen," the hot sandy wind that swirls and swelters from the south, is the worst ordeal of this type for a cameraman. He will cheerfully bite his hungry way through gritty corned beef and baked beans and wash it down with tepid sandy water, yet he will be almost sick with depression and anxiety at the thought of the murderous treatment of his camera and lenses, at the entire mercy of the insidious desert sand.

Another requisite, as I found especially on the November, 1941, Libyan offensive when the attack was staged deep from the isolated south, is for a war correspondent to be a first-class navigator and to understand thoroughly his compass and the ways of the sun and the stars. Many of the correspondents who were beaten on their early stories of that campaign, I noticed were brushing up on their mathematics and astronomy on their next visit to Cairo! Fortunately, after moving around the desert with the aid of an old-time "spinning jenny" compass and a protractor scale ruled out on a newspaper edge, I fell upon a sun-compass near a burning enemy tank that I was filming. From that moment, the sun's shadow was my greatest friend and my most certain guide.

If one knows how to cook—to make fancy and appetizing dishes out of a can of corned beef, a soup cube, an onion and a few army crackers; if one can dig a well-shaped and comfortable slit trench in which to sleep in safety, and be hardy enough to enjoy a cold winter's night without the protection of a tent; if one can grow a six or eight-day beard, and restricted to a cupful of water, shave it off without pain; if one is adept at finding "cover" that still gives a good viewpoint for a camera; if one likes the excitement of the unexpected; and the friendliness and goodness that one finds among people in common effort and danger—then a newsreel man's assignment in the desert is a grand and memorable experience.

The official help that a cameraman accredited to the Service departments receives does not mean, however, that initiative is no longer required. I found it still to be a virtue that yields dividends, especially at one time when I was trying to obtain facilities to accompany a squadron of bombers to film an actual air attack. Headquarters was adamant in its refusal to accede to this request. They did not wish to inflict the danger and weight of an extra body on a raiding machine, perhaps thus decreasing the chances of a crew returning safely to their base, should the aircraft be damaged by enemy fire.

I found, however, that many crews themselves minimized the extra risk, and were anxious to get their work really reported effectively, especially if it would bring vivid pictorial realization to the wide public for the need of more modern equipment. It only needed one hint from a bomber pilot, who cynically suggested that "the farther you get from Headquarters, the more you can achieve!" to set me off in the heat of the summer on a trip south to the most distant airdrome I could find, hidden in the Sudanese Fuzzy-Wuzzy country of the Red Sea Hills. There, surely enough, an enterprising Wing Commander agreed to grant permission. The first raid I accompanied was an attack on the harbour of Massawa. To get the necessary film coverage, I fixed my automatic camera in the rear-fuselage position, with a remote control to be released by the rear-gunner, to get the vertical climax shot of our own bombs leaving the ship and sailing down on to the target. As Massawa was well-protected from the point of view of anti-aircraft guns, another squadron of single-engine Wellesleys was

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"Let me introduce our new man—he has a metal plate in his head!"

sent over, timed to arrive from the opposite direction just before we were, in order to attract the attention of the ground artillery, and to give us a fair chance on low-level attack on the submarines and destroyers that had just been reported by reconnaissance flight to be in harbour.

It was a three-hour flight to that target, over the massive and unfriendly mountains of Eritrea. A three-hour flight with no landing grounds between the home-field and the target! It was no wonder that single-engined Wellesleys were far from popular among the pilots! Though it must be said, in defence of the construction of these machines and the reliability of the modern aero-engine, that few failed to return, except directly through enemy action.

We approached the harbour at great height and I found it no easy task to handle the camera at 15,000 feet without oxygen. I panted with the exertion of filming each individual scene. The pilot finally passed me over a scribbled message. "Here we go. Good Luck" and down, down we went in an ear-popping dive, 14-13-11-8-5 thousand, right down to 2,000 feet, the predetermined bombing height. We were surprised at the reception, until we learned later that the diversion bombing squadron had been delayed by the bad weather inland and finally arrived after us, so that now we received the full attention of the gunners below. I took scenes of the pilot and the observer and of the fast approaching target. Thermal bullets traced a lightning pattern in front of us and gray anti-aircraft bursts broke near enough to shake the machine, but as we flattened out, there was more than a normal lurch—the bombs were away! With the lightened load, we banked violently. I thought of the rear automatic camera, which by arrangement would have been switched on, when the yell "Bombing!" from the observer came over the rear-gunner's phones. I felt a comforting sensation after the brief but thrill-packed moments—but my contented sense of achievement was dashed on landing a few hours later on that steamy Sudan airfield, to hear the rear-gunner hail me in profuse apology. He told me that the signal had not come through to him—and the camera had not been switched on! It was no less infuriating to hear that our bombs had scored direct hits on those submarines tied up in the harbor! The second day, my camera-aircraft was forced back with engine trouble and not till the third day did we get the climactic picture of the bombs reaching their target. Thus it was that the final sequence on that picture, the first war-bombing filmed by a newsreel cameraman from an Allied squadron, showed in its climax the observer sighting along his bomb-sight wires, a closeup of his hand pressing the release—and, hey presto!, bombs and incendiaries falling into space, and on to the target—just three days later!

In the two years' coverage for Paramount News on many fronts, I had great personal luck, never suffering more damage than a twisted ankle and a slight tear to my shirt, the latter caused by a small shell splinter of spent velocity. But I was pinned down by enemy artillery more than once, and on occasions *too* close for pictures—as when a suddenly-appearing machine-gunning plane once made directly for my position, obviously suspicious of the reflected gleam from a carelessly-camouflaged aluminum lens-holder. From that time, all my equipment was meticulously camouflaged!

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CORRECT ANSWERS TO QUIZ ON PAGE 78

1. False. It is a fruit.
2. True. It is a scale of wind velocities.
3. False. Cotton-mouthed water moccasins are snakes.
4. True. The troposphere is below the stratosphere.
5. True.
6. True. 100,000 years ago.
7. False. Many other fruits and vegetables such as yellow fleshed peaches contain carotene.
8. False. Spot welding is a type of welding that fuses small areas together.
9. False. A kilowatt always amounts to 1,000 watts.
10. True.
11. True.
12. True.
13. True.
14. False. It is the larva of the sawfly.
15. False. It is made from sweet whole milk.
16. True.
17. False. Some bear fruit more than 30 years.
18. False. It is so named because its jaws operate independently.
19. True.
20. False. It is a type of sail.
21. False. They were so named because the paddle wheel is located at the stern.
22. True.
23. True.
24. True.
25. False. A compound lens is one that is made up of a number of parts or elements.

Attention, MI Readers!

We will pay $1 for each true-false statement which we find acceptable. Statements will not be acknowledge or returned. Address the Quiz Editor, MECHANIX ILLUSTRATED, 1501 Broadway, New York City.

Checks have been mailed to the following: H. Whittaker, Toronto, Ont., Canada; John H. Spicer, Owen Sound, Ont., Canada; D. B. Campbell, Miles City, Mont.; Leland C. Marks, Ithaca, N. Y.; Allan Miller, Brooklyn, N. Y.; Harold Musick, Camp Point, Ill.; A. C. Pvt. Tony N. Jewell, Camp Blanding, Fla.

I Filmed The World At War

[*Continued from page* 153]

My exit from the Libyan desert, during General Auchinleck's November, 1941, offensive that went sour through lack of quantity and quality of equipment, I was severely hampered by Rommel's "diversion tank column." It was only by recourse to a night ride across the Italian fortified positions along the escarpment that I managed to escape the fate of Eddie Ward of the BBC and of Godfrey Anderson of the AP, who had been my companions just previously, of being "put in the bag" by the enemy. As it was, I ended up in the early hours of the morning, after an all-night chase, by being blown up on a minefield. An unpleasant experience that proved to me, however, that even with a little navigational knowledge the shortest distance between two points is *not* always a straight line! Again, however, I had no serious personal injuries, and all that I lost was nonessential equipment—food, water, gasoline and some film. Every wandering newreel cameraman has to be his own mechanic, and it was no great matter to repair my camera equipment.

Other cameramen have not been so lucky. Alec Tozer of Fox Movietone lost a large part of his equipment when an Italian bomb, during a night raid at Sidi Barrani, found his truck to be a military target! The army driver, using the driving seat for his bed, was killed instantly, yet Alec and his Conducting Officer, sleeping in a slit trench, were unharmed. Borrodaile, one-time cameraman for Korda, was badly injured by burns and blast when the ship carrying him to Tobruk was torpedoed. In his camera at that time, were two precious scenes of previous torpedoes streaking toward his ship—just missing it, one across the bows and one past the stern. The third one was a direct hit.

In my opinion, and in view of the experiences I had in the tragic months that followed in the Far East from Singapore to Java and Australia, I have come to the conclusion that dangers to a cameraman filming war activities are inversely proportional to the opportunities for good stirring pictures. In other words — retreats are nothing but sick headaches! Unwanted, and "cold-shouldered," quite understandably, by the military authorities (who are lavish with their help and support at times of victorious advances), the cameraman endures many rebuffs and hardships and gets no reward in return in the way of worthwhile pictures. Even Dunkirk, the greatest of all retreats, failed to produce the factual picture that it deserved in view of its epic message.

In Tarakan, the oil bearing island off the north coast of Borneo, I filmed the preparation for blowing up the fields and near by, got my greatest thrill filming the first squadron of Flying Fortresses I had seen, on their way to bomb Davao, in the Philippines. I was forced to leave Tarakan however, when the size of the assembling Jap armada was known. The small defending garrison was overwhelmed, and the living remnants captured before I had arrived back in Batavia. In Java, there were no facilities granted to me by the Allied Command, General Wavell, my old chief in Libya, being adamant in his refusal to allow me, the only newsreel cameraman in Java, to film activities of this body. The Dutch, however, were fully cooperative, granting all facilities that a cameraman could desire, taking me over their defence positions; yet, before any film could reach a developing laboratory, the Japanese had conquered another territory. It was with a feeling of shame that one said a half-hearted "au revoir" to the grand and noble Dutch, to some of those fine and able pilots that were my best friends, though they knew there was no point in my staying longer, for the Jap hordes were now only a few miles away.

I returned from my round-the-world, two-year assignment rather sick at heart, with a deep burning desire within me: to help if only temporarily, on the one front that holds the complete secret to Victory, that of production. Fundamentally and inexorably, that problem has to be solved in all completeness, before a newsreel camera can record what we all want to see, and what I, as a cameraman, would like to film—the triumphant forward moves of all United Nations, culminating in Victory marches in Berlin and Tokyo. The newsreel screens have seen nothing yet!

"This is a new wrinkle. You put a record in the slot and the nickel comes out here."

Bacteria Sent To Chair

[*Continued from page 47*]

on the priorities list. Even the allotment to hospitals was cut 50 per cent.

California engineers tackled the problem. They developed and perfected the Sterozone, a machine that can filter and purify up to 9,000 gallons of water an hour by electrocuting the bacteria in the water. It uses no chemicals, is simple in operation, and can be carried anywhere mechanized troops can maneuver.

Under the watchful eyes of army engineers, engineers from the Los Angeles Department of Water and Power, and other technical men, the machine was given its initial test in the Los Angeles River, well within the city's limits. The test site selected was immediately below a dairy farm and a riding academy, where the water was highly contaminated.

To the satisfaction of all, the machine pumped raw, polluted water hour after hour into its cleaning chamber and discharged pure, sparkling water that had no taste or odor.

"First, the raw water is pumped through a filter, to remove suspended matter," explains its inventor, D. K. Allison. "From there it is passed to an absorber chamber where ozone, generated by a high frequency silent electrical discharge, oxidizes or literally burns up the bacterial contamination."

The sterilizing agent employed is ozone gas, generated within the unit itself from filtered and dried air.

Heretofore, when disinfecting particularly bad water with chemicals, there was always danger of overtreating. This often resulted in a disagreeable chlorphenol odor and taste that caused troops to prefer untreated, contaminated water. Too, the army's use of sterozone in the field eliminates the danger of accidental gassing of troops due to the release of chlorine from tanks hit by rifle, machine gun, or artillery fire.

The sterozone's operation is extremely simple. A small synchronous electric motor drives time dials. The dials maintain a cycle that once every four hours reverses the flow by reversing the raw water filters and the air dehydrators. The filter cut out of service is backwashed, and the dehydrator out of service is electrically regenerated. Since the operation is entirely automatic, the need for highly trained field operators is eliminated. Power is supplied by an automatic gasoline-engine driven 10 KVA, 220 V, 3-phase power plant. This unit is self-starting. The only attention required is lubrication and fueling.

Turn Your Hobby Into Cash

[*Continued from page 147*]

newspapers to the rest of the hypnotised group, insisting that he get paid for the make-believe papers he is carrying, giving change and so on. It was almost impossible to prevent a hobby like this from being turned into cash. Mr. Klein is in heavy demand at clubs, parties, socials and entertainments and is well paid for his demonstrations.

Roy J. Snell had a singular hobby—he bought trunks at express, railway and hotel auctions of unclaimed baggage. These trunks were invariably filled with things that had belonged to the owner. Mr. Snell enjoyed going through them, looking over the letters, pictures, old bank books, and all the other tell-tale souvenirs of the owner's life and character. From the contents of these trunks Mr. Snell enjoyed piecing together—as closely as possible—the story of the owner. Mr. Snell discovered that these stories were salable to magazines and book publishers.

R. V. Bilkosky, a California restaurant man, was interested in worms as a hobby. Science had declared that worms had no sense of hearing, and Mr. Bilkosky decided to find out for himself. He would put out some food, and whistle, and the worms would come hurrying up out of the ground for lunch. Then he found that just whistling would bring them out. I can't vouch for the scientific aspects of this experiment, but I can tell you that Mr. Bilkosky's worm hobby turned itself into a source of real profit. He had so many surplus worms he used to sell them to local fishermen now and then. Soon he was getting requests for worms from people everywhere. He now has a regular farm where he raises these worms, cans them, and sends them all over the country!

As you may already have concluded from these examples, practically any kind of hobby you can think of can be turned into cash, in one way or another, whether that hobby is blowing unusual soap bubbles or collecting stamps. The important thing is to offer something to the world that is different, or better, and that is either useful or entertaining. Once you have developed something of this nature, it is just a matter of selling it to the public, and sometimes this is just a matter of letting what you have created sell itself. There's magic in word-of-mouth publicity, as there is in radio. But don't be afraid to tell the world what you are doing yourself. Send samples of your work to the right people, display them in stores, or give demonstrations. If enough people see what you have to offer, or hear about it, some of them will prove to be important buyers.

THE JAPS SAY . . .

***"We shall always be able to mislead world public opinion."*—Baron Giichi Tanaka, former Jap Premier.**

AMERICANS SAY . . .

Are we going to let the little yellow so-and-so's mislead *us*? Not on your life! Buy more of those War Bonds and Stamps —buy till it hurts!

Get Job You Want In Army

[*Continued from page* 38]

Classification Officers do their level best, but they are not machines, simply human beings; they react to the men they interview much in the same way as an employer in civilian life who is interviewing applicants for a job: those who make the best impression get the preference! There is nothing unfair about this; it is as natural and unavoidable as life itself, and it has worked out advantageously for the Army. The best man usually makes the best impression.

If you want to get the Army job you would like to have, here are some tips for you, based on interviews with Classification Officers:

1. Be sure you can supply correctly such information as the birthplace of your father and your mother as well as yourself. These questions are a part of the written form, and to spell the names of the localities incorrectly, or not to know them, as sometimes happens, may help to convince the interviewer that you aren't very bright. A bad first impression as to your intelligence isn't going to help you, naturally.

2. When you're asked to state your hobbies remember that this query refers to active, productive hobbies—not those you've merely been interested in, or read about. For instance, radio shouldn't be listed as your hobby if all you do is listen to programs.

3. If you do have an active hobby, bring samples of your hobby work with you if possible, along with any other evidence of your special talents and accomplishments—letters, press clippings, certificates, medals, or any other material that will help to convince the interviewer that you really "know your stuff."

4. This same procedure also applies to your civilian occupation. If you want a similar job in the Army, produce all possible evidence of your qualifications, exactly as if you were applying for a job in civilian life and had to convince a skeptical employer.

5. Don't make the mistake of letting your desires influence the truthfulness or accuracy of your statements. For example, here's a man who is a good baker with four years' experience; but for the last six months prior to his induction he was employed as a machinist, and because he thinks an Army machinist gets more money than a baker he sets this up as his major occupation, minimizing or even falsifying his baking experience. As a result he may be cheating himself out of a good Army job, besides handicapping the Army in its drive for peak efficiency in every branch.

6. Don't attempt to overrate your skill or the importance of your civilian job. Because you've had some bookkeeping experience don't palm yourself off as an expert accountant. You won't get away with it!

7. If you want to earn the confidence of your Interviewer give him a complete, accurate picture of your talents, abilities, and experience in your hobby and your civilian occupation. It's important to be equally frank concerning your shortcomings.

8. Be prepared to answer fully the question concerning your "highest position of leadership or responsibility." These leadership possibilities may include experience as a foreman, employer, executive officer of a club, church or fraternal organization, Scoutmaster, or any other position in which you were responsible for the leadership and direction of other people. Confronted with this question unexpectedly, many inductees are unable to recall essential facts until the interview is over. Think back carefully and make some notations to bring with you; *don't wait until you are confronted with the classification form.*

9. A common stumbling block for selectees arises with the form question: "Duty desired now — arm or service preferred." Answering this question intelligently may help you get the Army job you want, but to do this you've got to know what the arms and services are and which specific duty you'd like. Write to the War Department at Washington for recruiting pamphlets describing the work done by the Army's various service branches: Air Corps, Cavalry, Chemical Warfare Service, Coast Artillery, Engineers, Field Artillery, Finance Department, Infantry, Medical Department, Ordnance, Quartermaster Corps, Signal Corps and the Detached Enlisted Men's List de-

"I'm glad it's not me up there fooling with that live wire!"

Get Job You Want In Army

partment. You may be surprised at the scope and variety of jobs in these various arms and services. If necessary, secure additional information from the nearest Army Information Service, Recruiting Station, or from the Recruiting Division of the Adjutant General's office, Washington, D. C.

10. Prepare your case ahead of time; there won't be time to do it half so well, or at all, after you arrive at the Reception Center as a selectee. To the best of your ability correlate your hobbies or special interests with your occupational background, training, experience and education. Then determine what specific Army job in which specific arm or service you are best qualified for and which you would prefer. The more thoroughly you present the facts, the better your chances of getting the job you want.

If you are already in the Army and you are convinced that you have not been given a satisfactory Classification because at the time of the Interview you failed to present the facts about yourself properly, there are two ways of correcting the situation. (1) You can write to the Commanding Officer of the Service Command in which you are located asking for a transfer to the particular arm or service you want to be in. Present your case as completely and effectively as you can. (2) You can write to the Personnel Procedure Section, Adjutant General's Office, Washington, D. C., outlining the facts.

Which Army job should you want? The answer is simple: the one you are sure you can do best, on the basis of your past training, special hobbies and interests, education, civilian occupation and experience, rather than one you think you would like to have merely because it pays more, or you *think* you would like it better. The easiest job in the Army for you is the one you are best qualified to handle. And if you present your case well to the Classification Officer, that's the job you'll probably get the moment a vacancy or need develops. At the rate the Army is expanding now, you won't have to wait long!

How Plane Instruments Work

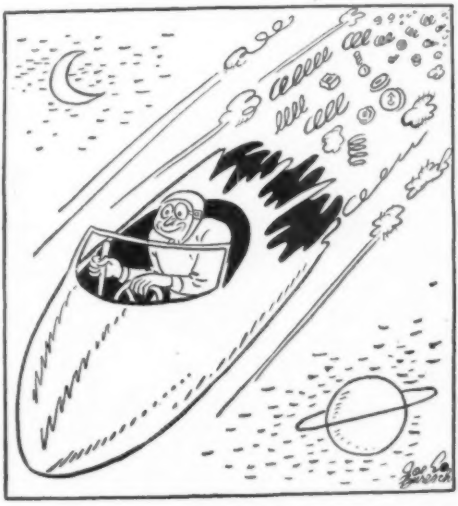
[*Continued from page* 58]

into it. The faster the plane flies, the harder the wind blows into the hose, and the more it swells out the flat sides of the "tin can" or diaphragm. One side of the diaphragm is connected to a lever arrangement that works the dial pointer and tells the pilot how fast he's going.

If you've ever noticed one of these "Pitot-static" tubes sticking out of a sport plane's wing, you've probably noticed another tube right beneath it. That other tube (static) has no hole in the front end, but has a lot of little holes in the sides. It's connected to a tube that also runs to the speed indicator—but it merely leads to the case around the "works." The object of the second tube is to equalize the pressure in the speed indicator case so that altitude changes don't make it inaccurate.

A somewhat similar diaphragm, or tin can, is found in altimeters—only this kind is all sealed up with nothing in it but a vacuum. A strong spring holds the sides apart so the air pressure won't squash the thing flat. As the plane takes it higher, the air pressure around it decreases, and the spring is able to pull the sides out a little bit farther. As this happens a system of levers connected to the swelling sides operates the pointer on the altimeter dial, and tells the pilot how high he is. The higher he goes, the more the diaphragm swells. This particular kind of "tin can" is called an aneroid cell.

A rate of climb indicator is really like a leaky altimeter. It has a diaphragm in it too—with a hose running to the outside air, but *not* pointing forward. The diaphragm is inside a sealed air-tight case, and that's the trick of the whole thing. Where the hose runs through that outer case to the diaphragm inside it, there's a tiny leak in the hose—purposely put there. As the plane climbs, the big hose sucks the air out of the diaphragm because the atmospheric pressure of the outside air is lower. This makes the diaphragm shrink inwards a little and cause the pointer to point to UP. The faster you climb, the faster the air



"Ha-ha! And they said rocket flight was impossible!"

How Plane Instruments Work

sucks out, registering a higher rate of climb. Meanwhile, the little pinhole leak inside the case is leaking— allowing the hose to suck air away from the *outside* of the shrinking diaphragm, and make it swell out again. If you stop climbing, the "leak" will quickly let the air out of the case, until there's no more "suction" because the pressure inside the case is the same as outside—and also the same as inside the diaphragm. At that point the diaphragm has perfectly flat sides, neither swelled nor shrunk, and the pointer shows zero climb.

When you start coming down, air rushes into the diaphragm through the big hose faster than it can leak into the space around it through the pinhole. Then the diaphragm swells out and the pointer shows DOWN. Tricky, eh?

Many of the other seemingly complex instruments use gyroscopes, or in plainer English, spinning tops. The artifiicial horizon, gyropilot, turn indicator, gyro compass, etc., are examples. They all have tops inside, which are usually driven by air blowing a little paddle wheel, or turbine around. When the plane tips up or down or sideways, the top pig-headedly remains upright and works the indicating stuff on the instrument face. In the case of the gyro compass and turn indicator, the top is lying on its side so it keeps pointing straight ahead when the plane turns left or right.

Bank indicators that go with the turn indicator are just little bent glass tubes with a ball rolling around in the fluid inside.

Tachometers usually operate by means of little weights that move out farther and farther as the shaft from which they swing spins faster. This shaft is connected to the motor shaft—usually by flexible cable like that of the speedometer of your car. Another type has a magnet spinning inside of a metal drum, and tending to pull the drum around with it.

Fuel gauges are among the simplest of all. One kind has a float on a pivoted arm. As the float moves up or down with the level of the fuel, it makes different electrical contacts which in turn move the gauge pointer.

Another type, similar to that frequently used on home oil burner oil tanks, has an air chamber running up from the bottom of the tank. As the fuel level rises, the increased pressure of the fuel on the air in the air chamber forces the air into a pressure gauge of the regular type—except that it's marked in gallons. If the air should leak out of the chamber one way or another there's a little pump provided to put it back in again.

The more involved of these instruments are illustrated in the sketches—with the funny little men doing their best to make everything plain. What the actual instrument looks like is shown by the drawings as follows: (A) altimeter, (B) tachometer, (C) Pitot-static tube, (H) air speed indicator, (G) temperature gauge, (F) oil pressure gauge, (D) artificial horizon, (E) rate of climb indicator.

Leathercraft

[*Continued from page* 140]

the leather companies. Place the skiver over it, press the two parts together firmly, and rub smooth. When the paste is dry cut the edges of the leather to the pattern line.

The edges are often laced together. Marking for lacing should be done very carefully, setting the dots for punching the width of the lacing in from the edge and the width of the lacing apart.

The simplest lacing stitch is the over and over stitch, but there is also a loop stitch that is more decorative and covers the edges of the articles.

In punching lacing holes on a piece which must be folded, or where two edges must be laced together, it is necessary to punch through both pieces at once so the two parts will fit together.

Snaps may be obtained from any leather company, and every full set of leather tools includes a snap applying outfit. Apply the snap after the lacing is finished, and with a little polish from a good wax your coin purse will be ideal for use as a Christmas gift or for sale to a gift shop.

Patterns can be made up for bookends, table mats, book covers, coin purses, handbags, card cases, key cases, wallets, bracelets, and belts. Patience is the prime requisite of proficiency in making leather articles. It is impossible to hurry your design or tooling or dyeing without sacrificing some of the artistry of the craft.

Your first attempts should be with small simple items, like coin purses or key cases or rectangular table mats, for in working with a new medium even an artist will make mistakes while acquiring a new skill.

When you have become proficient at designing, tooling, dyeing and lacing, you can start making objects for sale. If you want instruction in the craft, it can usually be obtained through art departments of high schools and colleges, and very often in summer camps.

Two Play Pens

[*Continued from page* 121]

corners. Strap-hinges and hooks and eyes are arranged as shown in the drawing.

A more elaborate pen, designed for very young infants and equipped with its own awning, has two amusement devices. One is a revolving coffee can containing a few navy beans which fall over baffles soldered in, and make a fine clatter. Wooden flanges are fitted to the ends. On the other side of the pen in an open panel, a number of colored wooden beads (the enamel, paint or stain should be harmless and non-poisonous) strung on 3/16-in. rods will amuse the child for long periods. Note that this pen is made in four units, the sides being detachable simply by unscrewing thumb nuts. The other two sides include the posts and beam across the top for supporting the awning. The latter may be of almost any handy material.

Your Wartime Car

by Frederick C. Russell

If you have a problem with your car, ask Mr. Russell. Just send stamped, self-addressed envelope for a personal reply to your letter.

Why do I have difficulty getting one of the front wheels to spin freely? Brake shoe clearances are normal. The bearings are not cramped. S. N. B.

Inspect the bearings but the chances are ten to one that the brake drum is slightly warped.

Try it!

Satisfactory gas mileage is not possible if the clutch slips. The test is to put the car in low gear, apply the brakes firmly and let the clutch pedal come up slowly while you are accelerating the engine. If the clutch is okeh the engine will immediately stall.

What is the purpose of the stabilizer bar at the front end of my car? R. G. Answer: It checks centrifugal force which, in turn, is the cause of tipping.

What should I use to plug up holes in the bottom of the gas tank? M. S. D. Answer: If tank is rusted through replace it. Water in gas causes it.

When installing a drag link how tight should the nuts be drawn up at the ball ends? S. G. Answer: Screw up nuts, back off ½ turn, insert cotter.

Will one filling of rust inhibitor last all summer? W. M., Jr.

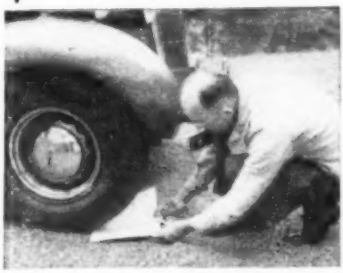
It depends on what kind of inhibitor you used, how much used and extent of car use. A pint is usually enough.

There are two sets of breaker points in the distributor of my car. Is there any simple way to tell if they are synchronized? F. P. W. Answer: Insert small pieces of white paper between the points and then crank the engine slowly. The papers should fall out simultaneously.

I have removed the generator and find that there is some end play in its armature. Is this normal? T. H. Answer: 1/32 inch play is enough.

I read somewhere about checking tire pressures by running the wheels over paper. What's the idea? D. D. L.

This is a means of getting a tread imprint. If a tire is properly inflated print will be even.

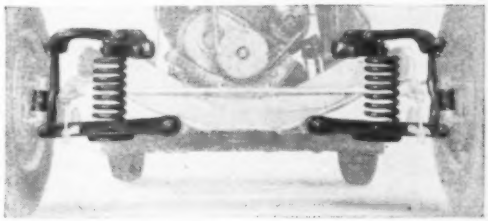


Is a carburetor accelerating "pump" the same as an accelerating "well"? H. E. H. Answer: No, although they are both designed to provide extra fuel for acceleration. A "well" is a vacuum controlled reservoir which discharges extra fuel into the carburetor body when the throttle is opened; a "pump" is mechanical.

I have trouble getting the horns to blow. There is one relay or booster, for the pair. When the horn button is pressed I plainly hear a click in the relay but no action develops at the horns. D. B. L. Answer: Apparently current is passing through the horn button circuit and the relay points close as they should. The trouble must, therefore, be in the horns themselves or in the direct circuit to them. Look for a loose connection or a short in the direct horn circuit.

There's a very annoying squeak in the bottom of the coil front springs of my car. Will turning coils around check this? K. E.

Raise the car on a hoist and then lower it in such a way that a stout log holds the center of the knee action unit to relieve pressure on springs. Then saturate bases with oil. [*Continued on next page*]



Your Wartime Car

[*Continued from page 159*]

Hint Of The Month

Some of that "pinging" you are getting this summer may be due to the carburetor heat control not working properly. Heat will not only produce a too dry mixture but one that is too lean. That results in detonation.

More Miles To The Gallon

One of the oldest and best rules for conserving fuel (not to mention tires and brake lining) is to avoid unnecessary variations in speed. The best results are had when speed is constant. This eliminates action of the carburetor's acceleration pump—a device intended for extra performance. Constant speed takes full advantage of momentum. When you don't slow down you don't waste the fuel used to build up momentum. Tires wear least when they roll with a minimum of resistance.

Try These Sometime

You can do a better job polishing the generator commutator with a strip of No. 00 sandpaper if you remember to clean it first with a cloth moistened in gasoline.

Be sure the tires are up to recommended pressures when taking the car to a service station for an alignment check, otherwise any adjustments that are made will not be accurate.

If you spill battery acid on your clothes or the car's upholstery neutralize it immediately with ammonia.

"When the entire class is assembled, Weatherford, I want you to pour the contents of this test-tube into this beaker. It creates a most horrible odor and no end of fun!"

Welder's Table

[*Continued from page 133*]

together 8" lengths of steel tubing or pipe. These sections can range from 1" to 2" or greater in diameter; and they can be assembled in any number and combination depending on the kinds and sizes of electrodes normally used. Insert wooden disks in the bottoms of two or more of the tubes, secure them with nails driven through the tube sides, and finally fasten the unit to the table top by wood screws or bolts passing through the disk centers, as shown in Fig. 6. Keep these holders well filled with electrodes, and you won't have to waste time looking for the right one.

A tray 12" long, made by welding endpieces to a half-round section of steel tubing as shown in Fig. 5, is handy for receiving odd lengths of electrodes, carbons, etc.

The work-holding vise clamped to the table edge is insulated from the steel framework by strips of non-conducting material such as bakelite or plywood, as shown in Fig. 2. One cable from the welder can be clamped to the vise without "charging" the whole table.

The welder shown rests on the lower cross braces and is controlled by a switch underneath the front edge of the table. The switch in the photos is a 3-heat, 40-ampere stove control that happened to be on hand; but any heavy-duty switch can be used. Power wires carrying 110- or 220-volt current run to terminals on the back of the switch support, and thence to the welder.

Several firebricks laid on the table make an excellent surface on which to work with a carbon arc torch or gas flame. The angle iron, projecting above the surface, helps keep the bricks on the table.

Other conveniences that can be added include a drawer for holding spare electrodes and other parts; a platform supported beside the welder by the lower cross braces, for holding extra firebricks, etc.; a backboard to intercept sparks; a water bucket for cooling work; and a shelf halfway between top and floor for holding gloves, helmet, etc.

Lacquer or enamel all metal parts of the table, using preferably a light color. The original bed casters were used on the table shown, but heavier industrial casters would be better. The table thus is a compact, portable welding unit that can be rolled wherever there is work for it to do.

Before aluminum became so important to defense, 25% of artificial limbs made in this country were aluminum; now wood and some fiber replace metal.

Now that the cyclotron is producing radioactive elements for treating disease, the University of California Medical School is giving a cyclotron course to medical men.

I Saw End Of "Sea Power"

[*Continued from page* 63]

literally tearing the ship apart. She burst into flames from bow to stern."

The torpedo bombers swung in so that the smoke screened them from cruiser and destroyer anti-aircraft fire, and 12 of their "tin fish" scored hits. They blasted the carrier to bits and she sank in a cloud of steam and smoke three minutes later.

"It happened so fast and the results were so final," one dive-bomber pilot told me later, "that when it came my turn to dive I saved my bomb. It wasn't needed. I picked out one of the cruisers instead." That bomb hit flush on the cruiser's deck. There was a blinding flash, and when the smoke had cleared the vessel had stopped. In a few minutes it slid under the waves, sunk by this one hit.

Back on the *Lexington* we could hear only a confusion of commands and conversation from the men in action, via the ship's loud-speakers which were connected with the airplane intercommunication circuits 165 miles away. Then from Lieut. Comm. Dixon came a strong clear call to the carrier, a crisp signal of victory: "Scratch one flattop," navy slang for the sinking of a carrier.

Three planes failed to return—all scout bombers. Two were believed victims of ack-ack fire; the third landed on Rossel Island and its men were rescued later.

The day's fighting was not over, however. Despite rain and low clouds our fighter squadrons went out. At dusk and in a mist they ran into a Jap Zero squadron of nine, dispatching five. I was in a group on the *Lexington's* flight deck talking over the day when out of the murk nosed nine planes, the leader flashing for landing. Then a gunner on one of our protecting cruisers recognized the planes as Japanese. He opened fire and was followed by every gun in the fleet. The planes snapped off their navigation and landing lights with the first shot and disappeared almost at once. I often wonder what would have happened if we had allowed the Japs to make a landing.

Following, a lone scout plane reported them alighting on a carrier only 30 miles away. Directed back to the *Lexington* by radio, this scout said a huge Japanese force was accompanying the carrier. The Japanese unquestionably were hunting us in the darkness. But contact was not made until the next morning when the Japs were reported 190 miles northeast, about 50 miles southeast of Tagula Island.

[*Continued on page* 162]

Jack And Gene

[*Continued from page* 46]

Gene will still continue his jack hospital while a senior high school student the next two years, and keep on banking the major share of his jack jack against the day when he'll need it for college expenses. Average income from this part-time business runs from $75 to $100 a month, occasionally soaring to the near-$200 mark. He handles about 15 repair jobs a month, his charges for labor running from $2.50 on a small jack to several times that for big jobs.

Now that war is here, and priorities are wrecking many a small business man, Gene is feeling the pinch. It is more difficult to get some of the parts for his repairs. In many cases, he can get them only when the customers have ratings themselves.

But Gene solves some of the problems without taking the time, money, and present red tape of buying parts. For instance, it became increasingly hard to get cup leathers for the rams that hold the pressure in the jacks. Gene made his own tool to cope with the situation, and now he designs his own cup leathers with it.

The tool is a piece of steel made like an insert for cylinder, and is sharp on one end, blunt on the other. And with it, Gene fixes cup leathers.

"First, I get a piece of raw leather," said Gene. "Then I take the tool and put the sharp end against the leather, open the vise and put the leather and the tool into the vise. As I squeeze the vise, it cuts the size leather I desire.

"It must have a hole in the middle, so by certain mathematical instruments, I can find the center and make the correct hole. Now I take the cup leather, put it on the ram head, then use the emery to buff it down to a smooth surface."

Gene finds that his cup leathers last longer than the original parts in the jacks. "And," he grinned, "I can make mine in fifteen minutes, while to order them requires at least ten days."

Firms for which Gene is the official representative are located in New York, Michigan, Wisconsin, and Minnesota. When a jack breaks down in a city closer to Memphis than the factory, it is sent to Gene for repairing.

THE JAPS SAY . . .

***"If we do not break the ambitions of the American people . . . our souls will know no peace."*—Admiral Yamamoto.**

AMERICANS SAY . . .

Then prepare for a restless future, Admiral—for our ambition now is to buy more and more War Bonds and Stamps, and buy them till it hurts!

Wind Small Springs

[*Continued from page* 139]

no great harm is done if I "misfire" on it.

Figure 1 shows the general plan for winding a small spring in a lathe. A nail, or any piece of steel rod about ¼ smaller than you think it should be, is held in any type of chuck available, and forms the winding mandrel. File a notch in end of mandrel ("a," Figure 1) to hold end of wire. When using a machine lathe, use the back gears and belt for lowest possible speed; hold end of wire in a pair of sturdy pliers, and pull strongly to supply tension. When springs are to be wound ½" or more in length, it is well to support the free end of mandrel in a hole in a piece of scrap stock held in the tailstock chuck, as shown. For shorter springs such support is not needed.

It is always advisable to wind springs a good bit longer than required, and cut them to the length needed; though when exact length is known, a square or "closing" coil ("b," Figure 1), is easily formed by a quick shift of the angle at which the wire is held, when reaching end of coil.

Figure 2 shows the difference between expansion and compression springs; when winding the former, hold the wire almost at right angles to mandrel, so that the coils touch each other; for the latter, the angle of the stock with the mandrel determines the spacing of coils. If spacing proves insufficient, hold ends of spring between pliers and give a quick pull to separate them.

Springs not wound with a "closing coil" may be finished to length and ends closed by holding lightly against side of grinding wheel, Figure 3. Light pressure heats the end coil red hot and brings it down squarely, without affecting the rest of the spring.

Figure 4 shows the same method of winding applied to a drill press, in case no lathe is available. When using a drill press, or a wood turning lathe on which back gears are not available, do not use power, but have an assistant turn the spindle at slow even speed by pulling the belt.

Figure 5 brings spring winding within the realm of the man who has no machinery at all; use the breast drill, held in vise as shown and have an assistant turn the crank with a slow, steady motion while you supply tension on the wire held in pliers.

For springs which must have their coils spaced with absolute precision, use a screw of correct diameter and thread pitch for a mandrel, Figure 6.

I Saw End Of "Sea Power"

[*Continued from page* 161]

Pilots, radio men, and gunners got into their planes, engines were turned. But the admiral delayed their departure an hour or more, fearing there might be a closer Jap fleet. Then Lieut. Comm. Dixon also reported the force previously seen, saying it consisted of two big carriers, many cruisers and destroyers. At 9:30 our real striking forces got off: 54 dive bombers, 20 torpedo bombers, and 16 fighter planes. Sixteen fighters and some scout planes were kept as protection for the fleet.

At 10 o'clock a scout radioed "Twelve unidentified planes approaching. Still 160 miles away on course to intercept you." We later figured that the Jap air blow had been "fired" at almost the same time as ours against them.

The next radio warning came at 10:50. "Big force coming in from right ahead. Sixty miles away." We were in for a knock-down battle with the Jap aviation. The *Lexington* immediately turned into the wind, launching all the reserve fighters and scouts. From here things happened fast and furiously. First came reports from scouts: "Enemy dive bombers and fighters, 17,000 feet, four groups of nine each." "Enemy torpedo planes spilling out of a cloud eight miles off, 6,000 feet, in steep dive."

I can fix the action of the next few minutes from my notes. 11:16. Guns aboard our screening cruiser belch smoke and flame. 11:16½. "Here they come," sang the lookouts. "Enemy torpedo planes coming on port beam."

"Hard starboard," said Capt. Frederick Sherman (since made a rear admiral) in a conversational tone to his helmsman. This maneuver was to present only the ship's stern, a narrow target, to the torpedo.

As he spoke, the Japanese aircraft came in view, slim silver monoplanes, low, spreading out fan-like, diving toward our port side at high speeds. All the 100-odd guns on the valiant old *Lexington* broke into a hellish chorus with a power that left us gasping in partial vacuums created by the blasts.

11:17 The Japs were so low the two lead planes had to pull up to skim over our protecting cruiser —and one was obliterated in a flash of flame by a direct hit from the cruiser. The others kept coming. They changed course to parallel the *Lexington* and then turned toward our port side, flying right into a hail of tracer bullets from our small guns.

11:17½ Eight dropped their "fish" about 800 yds. away, then continued straight toward us. Two were so low they had to zoom to get over us. Our forward 1.1 battery had the range of the first. It veered past us just under the bow, flames coming from the tail, and dived into the water 50 feet away. The 5-inch forward battery hit the second squarely overhead. The plane flew to bits.

The other Japanese flyers, trying to pass astern, were met with similar fusillades.

11:18½ The *Lexington* shuddered underfoot, and a heavy blast of flame flashed in a spout of water alongside. It was a torpedo. The wakes of others streaked toward us. Some were porpoising—nosing up out of the water and then diving deeply.

11:20 Wham—another torpedo hit. While we staggered as the *Lexington* flinched, a lookout called "Dive bombers!" Looking out I saw the first flattening out, having released a 1000-lb. bomb. "Boom"—it hit the port forward 5-inch gun gallery, wrecking it and starting a fire. And more torpedoes were coursing toward us.

11:21 "Baloom." Another torpedo hit, also on the port side. All around huge spouts of water were rising suddenly, mysteriously—"near misses" by bombs. In the midst of this I suddenly, illogically thought, "There's so much noise I can't hear any single explosion. It's almost like a silence."

11.22 Wham! Baloom! The *Lexington* lurched under the fourth and fifth torpedo hits, both on the port side. The water was foaming and laced with torpedo trails.

11:25 "Seven more torpedo planes," the lookouts called. The anti-aircraft fire was so hot these failed to press home the attack like the first group. All dropped their torpedoes while still more than 500 feet above the water, then turned away, never coming closer than 1,500 yards. The *Lexington* swung and avoided the torpedoes.

11:27 Five more Jap torpedo planes appeared in the fleet's center and bored toward our starboard. With the entire fleet firing at them they dropped their "fish" a long way out. The *Lexington* turned once more and all missed.

11:32 The last of the dive bombers swung by, raking us with his gunfire. His bomb fell close but missed, and suddenly there was silence. One hundred and three Jap planes came over; the guns took 19, an all-time high for a flight of this kind. Our flyers got 30.

Right through the bombing and torpedoing came a little yellow life raft. Drifting on it was a flyer who had been shot down. The fleet, speeding along at 20 to 25 knots, passed all around him so that for a few minutes he was in the heart of our formations. He was waving and cheering each ship as it went past him in battle. He was not calling for help. Captain Sherman signaled the last destroyer trailing the fleet to pick him up.

The *Lexington*, despite all her beating, was keeping up with the fleet. She had a six-degree list to port; the fire, however, had been put out. Even as the last dive bomber was departing, the ship began returning to an even keel. Comm. H. R. (Pop) Healy called Capt. Sherman to report

[*Continued on page* 165]

HARLEY-DAVIDSON
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Thousands of riders have enlisted their Harley-Davidson Motorcycles for duty on the home front. Many are riding in the service of Civilian Defense. Others are motorcycling to and from their war jobs, eliminating additional burden on overcrowded buses and streetcars. And because Harley-Davidsons use so little gas and oil, they conserve these vital war needs—and rubber, too!

While there are no new Harley-Davidsons available now for civilian use, your dealer may have some good values in reconditioned models. *See him today.*

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Name .....

Address .....

Build A Hydromobile

[*Continued from page* 131]

covered with automobile celluloid. Do not try to use cellophane as this will not stand up to the effects of water. The celluloid should be applied in sections after first making and fitting paper patterns on the job. Glue the celluloid in place and cover the joints (which should occur at formers) with paper or silk tape. Hold in place with small pins until thoroughly dry before sealing the joints. The entire window section should be given several coats of paint before actually applying the celluloid.

Runners:

Three runners are used for snow or ice. Cut them to the patterns given. Bass or oak is best suited for these pieces but any hard wood will do. Note that the runners are slightly hollowed to prevent skidding on snow. For use on soft snow a plywood "sole" may be attached to each runner. For use on ice a steel blade should be added. Rear runners screw or pivot to the rear spreader board. The front runner is bolted in place to the base board in a simple sheet metal hobbler. The front spreader board should be removed if the car is to be used in conjunction with the runners.

Wheels:

For road operation four 4⅜" model airplane air wheels are mounted on axles which are secured to the spreaders. ⅛" steel wire will do for the axles which may be attached to suit.

Pontoons:

During the winter months there is plenty of time to make up a set of the simple pontoons which, come summer, will turn this little car into about the speediest thing afloat—model or full size boat. The pontoons are built, as shown in the drawings, about a central former into which the bulkhead formers are half notched. The bottom of each pontoon is planked with 1/16" sheet balsa and the upper section is covered with silk. Before covering, small blocks should be built in for mounting. As in the case of the body it is suggested that the entire framework be covered with silk for better waterproofing and a neater job to boot. Note on the plans how the chine stringer and central former are beveled before planking and covering.

Motor Installation:

Any Class "C" motor is suitable. A smaller motor is insufficient for this rather large model. It may be mounted upright or inverted as shown in the drawings. The inverted mount is neater but required an on-the-job installation of the gas tank. The tank can be placed inside the body but if this is done the installation must be made before covering the body, for obvious reasons. The same may be said of the batteries and the coil. The condenser can be mounted on the motor bed but should be metal covered for protection. Four Bright Star No. 10 M batteries afford sufficient juice to make the use of booster batteries unnecessary for starting.

Propeller:

May be purchased or made but should be 12" diameter and carefully selected to suit the motor employed. For example; should your motor not run in reverse it will be necessary to make or buy a pusher type propeller. It is a good plan to shrink silk caps over the propeller tips as a precaution against damage from water.

Build with blueprints. MECHANIX ILLUSTRATED conducts a blueprint service for the convenience of its readers. You will find a partial list of available blueprints on page 32.

Ideas For Service Men

[*Continued from page* 125]

first washing at the hands of a Navy recruit—so take it easy. USE NO HOT WATER. Soak the blues, one piece at a time, in a bucket of lukewarm soap suds—a good soap powder is best. Be sure that all soap is thoroughly dissolved in the water. Wash by squeezing lightly, to force the suds through the cloth. Scrub white collar braid, rating insignia, etc., with a small clean brush—a five-cent hand brush is excellent. *Avoid brushes having red-dyed bristles!*—the dye will permanently stain and discolor anything white. Rinse the blues thoroughly through several buckets of lukewarm water. Do not wring—hang them up dripping, press out excess water between the palms, smooth and pull the garment to shape, and let it dry in open air.

White braid on collars and cuffs soils easily, long before the whole garment requires washing. When slightly soiled, the braided portions may be scrubbed carefully with rich soap suds and rinsed thoroughly by means of the brush and clean water. Press out excess water between folds of a towel, and dry.

NAVAL RECRUITS MISS THEIR POCKETS! The dinky little pocket on the inside of the dress jumper is both too small and too high to be useful for anything. But a longer pocket, suited to holding fountain pen and pencil, letters, cigarettes, etc., may easily be sewed in and located just where you want it.

I Saw End Of "Sea Power"

[*Continued from page* 163]

all torpedo damage shored up, fires out, and the ship's list straightened. He added: "I would suggest, sir, that if you have to take any more torpedoes, you take them on the starboard side."

Five torpedoes had torn holes 20 to 30 feet in diameter in the port side along and below the water line. These had been "forgotten" by the expedient of closing off the required number of watertight compartments. This had not noticeably affected the buoyancy.

At 12:45 p.m. there was a heavy dull explosion inside the hull. My knees buckled as the ship shook. Damage parties found that the blast had come from deep within and had twisted heavy steel watertight doors from their hinges. The explosion had been caused by the igniting of volatile vapor from aviation gasoline that had seeped from storage tanks through bulkheads fractured by torpedo and bomb explosions.

The blast had killed Pop Healy who had been working below, and thrown Comm. Arthur J. White, ship's surgeon, through one of his hospital doors, breaking his collarbone and an ankle. Despite these injuries he dragged himself around for five hours tending other casualties. He quit only after the order to abandon ship had been given and he had seen the last wounded man evacuated from the hospital.

A series of explosions began about a half-hour later, each damaging the gas tanks further. The steering and communications systems failed after the fourth explosion due to the loss of electric power for the bridge control. Men were stationed at the hand-operated wheel deep inside the ship, and orders were transmitted along a line of men from the bridge to the wheel.

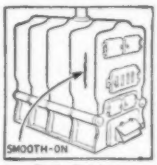
During this time the damage-control gangs and fire fighters were desperately fighting to save the ship. This fight was becoming hopeless. More than 25 per cent of the below-decks section was now a blazing inferno. Smoke was so dense that flashlight beams would not penetrate it. Only the men's familiarity with the interior of the ship enabled them to move around. Some of them were burned or killed by almost every explosion. The blasts bounced men off the steel walls. Bones were fractured, heads broken, and with it all there were critical burns. Medical records for the *Lexington* show that half the casualties were caused by explosions and burns.

At 4 p.m. Capt. Sherman ordered the engines stopped and the fire rooms abandoned. The *Lexington's* speed fell off rapidly until she was drifting helplessly sideways, smoke blanketing everything on the starboard side.

Admiral Fitch leaned over from his little bridge at 5:15 p.m. and spoke to Captain Sherman on the navigating bridge 10 feet below; saying in a conversational tone: "Well, Fred, I guess it's time to get the men off."

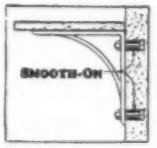
[*Continued on page* 167]

A WAR-TIME NECESSITY
IN EVERY HOME

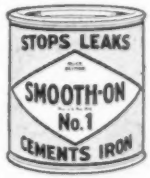


Seals Cracks

Stops Leaks



Tightens Loose Parts



Get SMOOTH-ON in 1¼-oz., 7-oz., 1-lb. or 5-lb. can from your hardware store or from us.

Don't worry because war requirements make it difficult or impossible to obtain new boilers, radiators, heaters, tools, fixtures, utensils, etc.

With a can of SMOOTH-ON No. 1 in the house, you can stop leaks, tighten loose parts, and keep your plumbing and heating systems, hardware, tools, etc., in first class condition. SMOOTH-ON will also stop leaks and tighten loose parts all over the car, too.

Smooth-On is easy to use, because this many-purpose iron cement requires no heat, no dismantling of parts, and no special tools. It is economical, because a few cents worth will do most repair jobs, and the unused part of the can does not deteriorate.

For 45 years Smooth-On has helped householders save time and money on repair work, and today, it's more of a household necessity than ever before.

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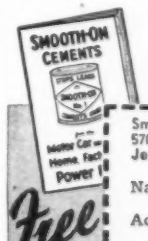
40-Page Repair Handbook chock full of practical repair hints that will help you to keep household, car, and shop equipment in good condition and enable you to repair what you can't replace. Your copy sent free on request.



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Do it with SMOOTH-ON

Keep Tools Free From Rust!

[*Continued from page* 142]

Pure Neatsfoot Oil } Equal Parts
Pure Olive Oil }

Refine each separately over a water bath, with some lead or zinc shavings to render them acid-free; when cool, decant, mix thoroughly, and Bottle.

An excellent rust inhibitor and lubricating oil for micrometers and other delicate instruments consists of equal parts of pure sperm oil (obtainable only at watchmakers' supply houses) and *Gulfoil*, a product of the Gulf Refining Company. It is not, however, a particularly good rust remover.

Once rust has taken a firm hold, its removal is difficult. Rust "eats" into steel and iron, and once it has "pitted" and destroyed surface metal, such metal cannot be replaced. Mere oil and scouring will not remove it entirely, but will leave the surface badly discolored.

The best compound I know of, and the only *perfect* solvent for rust I have ever found, is No. 100 *Rust Go*, put out by the Delta Manufacturing Company, Milwaukee, Wisconsin. This has proven a complete solvent for all rust on iron and steel; on a pad of cloth, or fine steel wool, it almost instantly dissolves all rust formations, leaving iron or steel glistening bright as when new. But neither this nor any other compound can replace metal destroyed by rust; and when rust has gone deeply enough, the surface, though bright, will be left rough by *Rust Go*. It is an excellent product, too, for completely removing rust from gun and rifle-barrels—though the same applies here, also. Best to prevent rust and save the metal.

Anything which will thus dissolve rust will, of course, attack iron and steel; so *Rust Go*, after use, must be completely removed—and quickly. On gun barrels, or internal parts of tools not readily accessible, the use of *Rust Go* should be quickly followed by an application of clean boiling water—this to be blown out with compressed air, and then oiled thoroughly.

The Delta Co. also supplies a highly efficient rust preventive compound, known as No. 109 *Stop Rust*. This forms a protective film over the work which has been de-rusted, and which retains its effectiveness long after being lightly wiped off.

"How the deuce do you stop this thing? I never was on one before."

It is also an excellent polish for machinery parts and other bright surfaces.

For finest tools, such as micrometers and verniers, and for guns, an excellent preparation is *Rig*, supplied by Rust Inhibiting Products, of 5830 Stony Island Avenue, Chicago, Ill. A very light, clear grease—much lighter than vaseline—it is the most remarkable rust inhibiting grease I've ever known, besides a marvelous lubricant for light mechanisms—and it never gums nor forms a "tough" coating in any weather. Moreover, it possesses this valuable quality—a very thin coating of *Rig* swabbed on a gun, rifle or pistol barrel soon after shooting, renders all further cleaning entirely unnecessary—and there will be no rusting or fouling, *and you may depend upon it!*

Particular care should be bestowed upon the contact surfaces of micrometers and verniers—for, when once damaged by even the slightest amount of rust, they cannot be restored except by most careful lapping, and subsequent adjustment for take-up of wear.

Scales and other calibrated tools are often worn down by repeated rusting and polishing off, to a point where the markings are no longer clear. These may be renewed easily as follows:

Prepare a solution of:

Mercuric Nitrate crystals	grains 73
Bismuth Nitrate neutral crystals	grains 128
Copper Nitrate crystals	grains 55
Nitric Acid (by weight)	grains 183 (2½ drams)
Water, q.s. to make ½ pint.	

To use, polish off the tools with fine abrasive, and boil for a few minutes in a soda solution to remove grease; rinse and cool. Coat all over, lightly, with above solution, which will turn them black all over; let stand five minutes, then boil five minutes in clean water, then rub with steel wool, or buff lightly on a fine scratch brush. Repeat above operations for two to five passes, according to how the black finish takes hold. *Then*, polish the surface bright with finest emery cloth, or "wet and dry" paper to give a bright surface finish, leaving the calibrations a deep, strong black. This method may be used to give an all-over black finish on any tools, guns, etc.

I Saw End Of "Sea Power"

[*Continued from page* 165]

Forward all was ablaze and the flight deck too hot to put foot upon it. Destroyers came alongside and we transferred our 160 wounded men. Hundreds of others stepped aboard the vessels. Still other hundreds slid down long hemp ropes into the Coral Sea waters. Life rafts were floating around the stern. Whaleboats were plying between the other ships and the *Lexington*.

I joined a group of pilots who had salvaged several two-gallon cans of ice cream from the ship's store. We sat around under the wings of planes parked on the deck and ate it from paper drinking cups. This was typical of the leisurely way the ship was abandoned. There was no hurry, no scrambling. This discipline was part of the reason that 92 per cent of the *Lexington's* personnel was safely transferred.

As I climbed aboard the rescue ship, the whole length of the carrier was ablaze with a fierce white fire consuming the 80,000 gallons of aviation fuel and million gallons of fuel oil from tanks now wide open. Blast after blast rent the ship but she floated high and upright. A destroyer administered the finishing coup: four heavy torpedoes at close range. They opened new holes. The *Lexington* slowly filled with water and gradually, still upright, slid with a prolonged hiss beneath the water.

"She was a lady to the end," one of her officers exclaimed as her flames died away.

In her last fight the *Lexington's* air arms launched stronger blows than she received. While the Japs were attacking her, our planes swept through clouds and rain for 200 miles of fierce, continuous air combat, and to hit their ships hard. Both bombs and torpedoes dropped by planes from the *Lexington* scored three hits on one of the three Jap carriers, starting it to blaze fiercely, gutting it at least. Twenty-four dive bombers from the second U. S. carrier scored seven hits on the second enemy carrier, sinking it.* One of these hits was the result of perhaps the most determined and gallant acts of the entire five-day conflict.

Lieut. John L. Powers, one of the pilots, had told his comrades he was going to put his bomb into a Jap carrier "come hell or high water." He held his ship straight for the Japanese deck until he was down to 500 feet—point-blank range. He released his bomb there, and began his recovery. The explosion shattered not only the ship but Powers' plane.

"John knew what he was doing," one of his fellow pilots told me. "If you go below 700 feet in your recovery the blast will get you every time. That means you must release your bomb no lower than 1,000 feet. He held his to 500 feet and probably was below 300 feet when the explosion came. He just decided not to miss, God bless him."

* The Navy official communiques which claim only one Jap carrier sunk are ultra-conservative.

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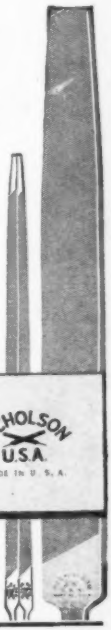

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Waggery Through Air Power

[*Continued from page* 146]

I propose in this article to instruct you in the fundamentals of paper glider construction, and include a few of my more simple designs as practice projects. Once you have mastered the technique of building these you can embark on a career of joy such as you have never imagined possible, for your hands are the tools, mere paper the materials, and the whole broad sky your medium. Thermals will become your everlasting and untiring friends, city pigeons your sworn and cringing enemies, and you will know the thrill of the combat pilot as your *Conical Greebie* sweeps over the heads of the human ants crawling in the street far below. You may even become familiar with the city jail.

We will start with the simplest type of Flollyslod, invented by me in 1884 and known as the *Ordinary Dart Type*, No. 2 in the photograph. This is a simple folded job requiring only a single sheet of letter paper. It has been extensively taken up by institutions of learning, Rotary Clubs and stockbrokers. A sketch shows how it is fabricated.

No. 5, a Dart Type with cathedral wing edges is an advanced development of the *O. D. T.* just described. It is greatly refined and has more lift and stability than its forerunner. The "gull" or cathedral wing edges channel and compress the air under the wings, giving an aspect ratio of .00003125 and a gliding ratio of 52 to 1. Under favorable conditions this glider will turn in amazing performances, and once flew for 3½ days in a four mile circle around Mt. McKinley.

The Flying Wing, another little invention of mine (though claimed by various other "designers"), is represented in Nos. 4, 7 and 8, the *Conical Greebie*, *Foobie's Fancy* and *Gooss-Boolb*, respectively. Most interesting of the three, perhaps, is the *Conical Greebie*, for no particular reason. Its odd, semi-circular fuselage with closed pointed nose creates a partial vacuum in flight that gives a tremendous added lift to the stubby wings. The two small, vertical stabilizer-rudders lend extreme maneuverability, and the *Greebie* will perform a variety of aerobatics in competent hands. To make it, simply roll a sheet of paper into a cone, paste up, then cut and fold as shown in sketch.

Foobie's Fancy, developed in the days when I was the mainspring of Foobie Enterprises, is best constructed of light tissue or carbon copy paper. Mail order catalogue stock will do in a pinch. The leading edge of this remarkable flying wing is rolled around a straw after being coated with library paste. If you have no library paste, mix one part flour, one part Parmesan cheese, two parts gin with a few shavings of saddle soap added. This will make an adhesive that will astound you. It certainly astounded me. Paste the *Fancy's* rudder along the centerline, as indicated. Bend in a slight dihedral and launch, holding by the after portion. If tail heavy, add a paper clip to the front. If nose heavy, apply a larger rudder, or just throw the whole thing in the waste basket and try the *Gooss-Boolb* instead.

This latter is one of the best of the flying wings, and will often gain altitude until it is clear out of sight, especially if projected where favorable thermals prevail, such as the North tower of the Taj Mahal, or the 27th floor of the Park Central Hotel in New York City. The leading edge of the *Boolb* is rolled and flattened, but not pasted. Combination stabilizers and rudders are cut as shown in the drawings, and the whole wing creased along the center to obtain dihedral. The design of the *Boolb* is really a masterpiece of applied aerodynamics, and the process of its development from a flat sheet of paper through sheer mathematical thought is a milestone in the history of aviation.

We now leave the flying wings and come to the last word in paper super-gliders—the absolute ultimate as far as the amateur Flollyslodder is concerned. Here we are tottering on the brink of the unknown; we are approaching c o s m i c forces perhaps better left forever h i d d e n from the prying eye and clumsy hand of the layman. Beyond this point none but a few Magi of the monoplane dare venture, lest they discover things not intended for their puny minds, and in so doing destroy themselves.

Please look again at the photograph of the gliders on the table. At the beginning of this article I said I would show you a few *simple* designs to practice on. Do not be misled by that word "simple." It is purely relative. To me these designs are

"Of course I'm tired—the instructor made me stay after class and write my name 200 times."

simple. But for you it may be another matter. It may well tax your ingenuity to the utmost to successfully execute any one of these remaining Flollyslods, even though they have been reduced, so to speak, to the lowest common denominator. If you are a timid, indecisive person inclined toward neuroses, you had best go no further; what I have to say from here on is for those possessing courage, determination and a ready wit. And two years of education or its equivalent.

Now where was I . . . oh yes, the photograph; No. 1 is the *Double Tweetzle* with triangulated fuselage. No. 3 is the *Tubular Flooch*, similar to the famous *Folding Flooch*, but with rigid wing structure, dihedralled at the tips. No. 6 is the *Square-Bellied Feather Bomber*. Last, and a real achievement if you can do it, is No. 9, the long range, twin-tube *Pslerkfilb*. This glider, with a wing span of 3 ft., will down the Luftwaffles with syrup.

In building any of these four, you must bear in mind that Joukowsky's vortices may form behind the lateral cylindrical structural members, just as Bernouilli's law will account for reductions in pressure at constrictions in longitudinal tubular structures. Allowances must naturally be made.

With the exception of the *Flooch* all these gliders have long, narrow wings with rolled, cemented leading edge and variable aspect ratios. In addition, the *Pslerkfilb* has a portable F. M. ratio as standard equipment. Wings are not full cantilever, but require supporting struts (rolled and flattened) to buttress them against the fuselage. The latter are folded to correct sectional shape (round, square or triangular; or, if the builder is real ambitious he may make them dodecagonal) and cemented along their longitudinal axes. Tail assemblies are clearly indicated in the plans. Paper clips may be used to obtain perfect flying balance, and the tail surfaces may be adjusted to control flight direction and elevation. The proper flying formula for the gliders is as follows:

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Toy Catapult

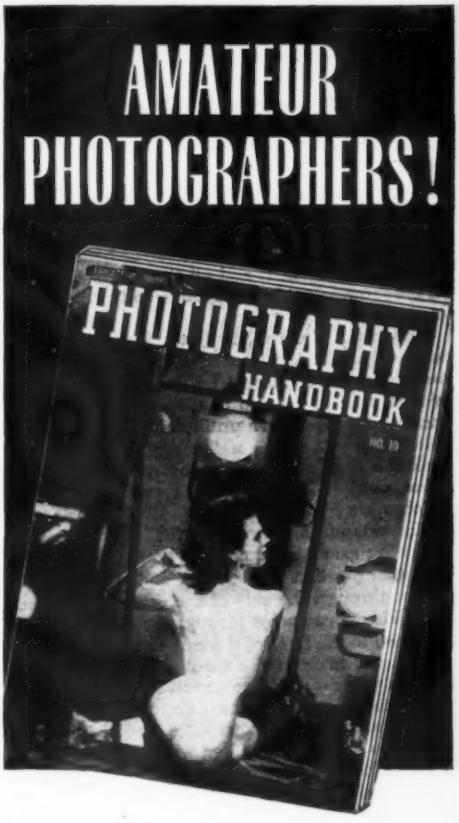
[*Continued from page* 111]

comes from rubber bands twisted in the same way that the ancient Greeks twisted the skein of sinew. Bend a piece of stiff wire into the shape of a hook as shown in Fig. 1. This hook has an opening large enough so that rubber bands can be slipped into it easily and so that they can be replaced if they break.

Two of these hooks are needed. Next drill two holes in the sides of the cart and reinforce the holes with metal plates as shown in the photos. Thrust the straight shanks of the hooks through the holes from inside the cart, and bend into cranks on the outside.

An improvised pivot-catch of scrap metal on each side of the cart will hold the cranks when

[*Continued on page* 170]



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Toy Catapult

[*Continued from page* 169]

the twisted rubber bands are fastened into place.

The rubber bands are stretched between the hooks. They should not hang loosely. If they do, double them. The correct number of bands to use can be determined by experiment. In the original catapult the rubber bands, when tightly twisted, formed a skein slightly thicker than a lead pencil.

Next, force the throwing arm between the rubber bands. The same number of bands should be on each side of it and all the bands should lie in the grooves cut into the lower end of the throwing arm to receive them.

Now twist the rubber bands by means of the wire cranks, being sure to give both cranks the same number of turns. The direction of the twist is such that at the top of the stroke the hand is moving forward. Turn until plenty of resistance is felt. This will make a "peppy" catapult. Then lock the cranks in position by means of the two pivot catches. For details of cranks and pivot catches see Fig. 2.

The catapult is now ready for loading. Pull the throwing arm back until it is horizontal and hold it in that position by means of a piece of stiff wire thrust through the side of the cart from the outside. This wire passes through a staple in a block fastened to the floor of the cart and into the screw eye in the back of the throwing arm. When the wire is withdrawn the catapult shoots.

A good target for the catapult can be made from tin cans of various sizes nailed to a stick. The cans are partially filled with absorbent cotton so that the ball does not bounce out, but remains in the can. The score on the tin can target shown in the photo is 5 points for the large can, 10 points for the middle can, and 15 points for the small can. Each player has six shots each time he is up, and the winner is high man after six rounds.

It will be found that a sheet behind the target will keep the balls from bouncing all over the room, while a piece of plywood with "side rails" will cause the balls to roll back to the catapult.

Toy Catapult Dimensions

In further reference to the dimensions, as explained, the size of the ball that is used as a missile governs the size of the whole catapult.

The arm itself is nine times as long as the diameter of the cavity. Thus in the catapult illustrated, the cavity is ⅝" in diameter, while the arm is 5⅝" long.

The heavy lower end of the arm is two inches wide, and the inside width of the cart is three times this—or 6".

The bumper that stops the arm is just high enough so that the ball can clear it with about ⅛" to spare.

The length of the cart is slightly greater than its width.

If a catapult that is larger or smaller than the one illustrated is contemplated, it would be advisable to keep all of its parts in about the same size relationship one to another as the ratio given here. Slight variations, however, will not matter. This gives the amateur craftsman a little leeway in the use of scrap material.

Shotgun Accessories

[*Continued from page* 138]

front sight accurately between the blocks, preventing cross-firing; while the height of the blocks, and the height of the brass rivet heads, afford two positive elevation points to prevent over or under shooting.

Figure 2 shows an improved type of shotgun cleaner which may be easily turned up from a scrap piece of brass rod—the harder the brass the better. Make it about 3½ inches long over all, with the shank threaded to screw into your favorite cleaning rod . . . or, make a rod from a straight piece of dowel rod or tubing, fit it with a brass ferrule, and thread shank of cleaner as desired. A section should be turned about ⅛" smaller than the bore of gun, and sharply knurled to provide an easy finger grip.

The "business end" is made by first running on a very sharp, coarse V-thread—say ten or twelve threads per inch. The turned diameter of this part should be such as to just pass through the choke at muzzle of barrel, with light contact. See A, Figure 2.

This section is now split by two sawed or milled cuts at right angles to each other, B, Figure 2, dividing it into four sections, and these are spread slightly apart to afford tension against barrel wall. This type of cleaner is excellent for scraping out lead, powder fouling, and even rust, with no tendency to wear or damage the barrel. It should always be used from rear, with muzzle of barrel resting on floor to prevent the cleaner being pushed out the muzzle. For final cleaning and oiling, a square flannel patch may be inserted into one of the slits and its opposite ends wrapped round the cleaner—the threads will keep it smoothly in place and prevent bunching or clogging in the bore. When the threads show wear from prolonged use, they may be sharpened up by means of a 3-square file, and the ends spread open slightly to take up the wear.

Novelty Napkin Holders

[*Continued from page* 117]

the base (½" plywood 3½" x 7"). A ¼" dowel 3" long is glued into the face for the Brownie's nose which helps to hold the napkins in place.

Folded napkins are kept in place by two sailboats sawed from ¼" plywood and fastened together side by side with ¼" dowels 4¼" long.

Sand all the edges slightly round and paint with shiny enamel.

The average man's jaw exerts 180 pounds pressure per square inch, when he chews.

New aid in preventing explosions is a conductive black rubber flooring for use in munitions plants where floor surfaces must be good conductors of static electricity.

More Foods "Puffed"

The "puffing" process, long familiar with whole-grain breakfast cereals, is applied to many foods, as well as nuts, coffee beans, psillium seeds and other articles of human consumption, in a series of patents (No. 2,278,463, etc.) granted to Albert Musher of New York and assigned by him to the Food Manufacturing Corporation of Chicago.

Principal application of the newly patented process is to dehydrated vegetables, fruits and meats, with the object of eliminating the long soaking period usually necessary before such products can be cooked. The dehydrated foods are placed in a steam pressure chamber, where they are subjected to pressures up to 50 pounds per square inch, at temperatures from 350 to 800 degrees Fahrenheit. After a suitable period the pressure is suddenly released, and the foods come out very much bulked up, ready for easy cooking.

Luminous Darkroom Timer

[*Continued from page* 98]

lower half of the timer can be arranged to obliterate one luminous line for each minute that has passed. (The first of these methods is preferable.) The luminous paint can be purchased, but you can easily make it by mixing luminous powder with a syrupy solution of gum arabic in water. In place of the latter, pure gum mucilage might be used. The firm mentioned above as supplying the luminous powder will also accommodate with vials of the paint at the same price, but the arrangement holds for readers of MECHANIX ILLUSTRATED only.

Processed Portraits

[*Continued from page* 94]

prevent superfluous details from competing with the design in the frame, and a better presentation of the center of interest will result. Pictures of all sorts of frames can be taken at art exhibits, art museums, and even through the show windows of art stores.

An ultra-modern effect is shown in Figure 2 (Page 93). Here, the portrait is presented in the form of a mask set on a square pedestal. It was produced by cutting out the face of the portrait in the manner shown, and pasting it on a photograph of a box. This combination was then pasted over a clear sheet of paper of which the upper right hand corner was darkened slightly to give a spotlight effect. The completed paste-up was then copied to produce the finished picture.

From this, you can see that there is practically no limit to the variety of ways in which you can present your portraits. You might cut out heads and copy them pasted to all sorts of decorative plates, plaques, or materials. You might, perhaps, paste a cut-out profile over and slightly behind a cut-out silhouette of the same profile, to produce a sharp, shadow-outline effect. Let your imagination be your guide.

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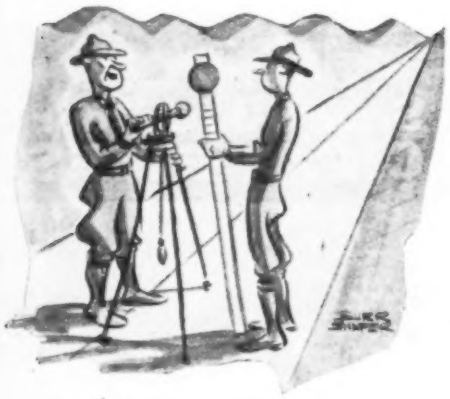
Precision Scope Mount For Your Rifle

[*Continued from page* 137]

together by the solder, both hands may be roughed to form on shaper, milling machine—or, if these are not available, by roughly lopping out with the hacksaw and then grinding and filing to final form and size. Leave the bands which encircle the scope ⅛" thick for the present. The split portion of the base should now be cut almost—but not quite through—either with a 1/32" saw on the milling machine, or by careful hand work with a good hacksaw. Leave a slight web of metal next to the inside of band, to be cut through when other work is finished. The two holes for the clamp screws may now be drilled and tapped—of course, making them body size for the screws in the upper half, and tap size in the lower half—and counter bored for a filister head. 8-32 screws are all right, but 8-40 is better, if you have the tap and die, or wish to thread them on the lathe. Use standard machine screws if you must, but it is better to make them, threading only the lower end, for maximum strength. The filister heads need be only about 1/32" larger than the body—according to the drill or counter bore you have handy for counterboring for the heads.

Now heat the work to melt out the solder, separating the two bands, and cut the male dovetails on bases. These are neatest when done on milling machine, using a 60° cutter of small diameter, to avoid carrying the cut through inner edge of band. If no mill is available, they may be cut on the shaper—or even by hand, using a sharp 3-square file with one side ground smooth to make it "safe." If cut on shaper or with file, it will of course be necessary to carry these cuts straight through. The band portion should now be "crowned" by light grinding, and finish filed all over, leaving bands 1/16" thick in center, and 1/32" or less at edges. Polish smoothly with abrasive cloth to remove all file marks, then buff to a bright finish.



"Let's put in some curves."

The removable base, Figure 3, comes next, and the sketch is largely self-explanatory. This was made from cold rolled steel, 5/16" by ⅝" and is about 3¾" in length—this length depending somewhat on the rifle to be fitted. About 3" from center to center of the barrel bands is desirable for the sake of rigidity in the mount.

The two dovetails are milled, shaped, or filed in (according to your equipment) and should be a close, but not a hard drive fit on the band-base dovetails. A smooth fit requiring just a few light taps with a small brass hammer to move the bands, is correct.

The longitudional dovetail, "D," Figure 3, preferably cut on the milling machine, with vertical attachment, and using a cutter like that shown.

Note the hole "H," and the slit "S" in Figure 3. The slit may be cut with a 1/32" milling machine saw; or, a row of 1/32" holes may be drilled close together for a space of ½", then filed into a short slit which may then be lengthened as required by means of a jeweler's hacksaw, used slowly and carefully. The hole "H" is drilled tap and body size for a ¼-20 machine screw, and tapped out as shown. The large end should not be countersunk or counterbored.

Figure 2 shows the lever-screw which does a double locking job to hold the removable base firmly on the side plate. The quick thread gives sufficient "squeeze" on the removable base, over the center slit, to clamp it very rigidly; and in addition the screw, turning half its diameter into the notch in the top of side plate, also locks it and holds it in the same position each time the scope is put on the rifle. When lever is turned ½ turn to the left (forward), the flat section of screw clears the male dovetail on top of side plate, permitting the removable base, with scope attached, to be drawn off the rifle to the rear. When replaced, by pushing it on forward, lever is then given ½ turn right, which tightens the screw and at the same time brings its round side down into the notch.

This lever screw (as well as all the other screws) should be made of tool steel, hardened, and tempered to dark brown running to purple. The lever screw may be milled, turned, or sawed and filed from a single piece (the most desirable way); or made in two pieces, the screw shank being made from drill rod and set into the lever with a fine thread, then the end pened to rigid permanent joint and carefully filed and polished. Screw should be threaded only at the end, and should be only long enough to reach through the removable base. Make the lever portion about 1" long, and follow the general shape of the top lever of a high grade double barrel shotgun. Sides of lever should be neatly file checked, or stippled with a matting punch.

The side plate, Figure 4, should be of cold rolled

[*Continued on page* 174]

Junior Achievement, Inc.

[*Continued from page 73*]

month is tops, including electricity). The kids elect officers and directors, decide on a name for their "company," and apply for a Junior Achievement charter which licenses them to operate under the parent organization. They raise capital by selling shares of stock at from 25 cents to 75 cents a share. Each member is required to buy a share and thereby become a stockholder in his "company." With $75.00 to $100.00 of raised capital, they buy tools and supplies, set up their workshop, and "open for business."

Keeping their own books, they become familiar with production costs, overhead, taxes, etc., and thereby learn to be efficiency experts. They meet one or two nights a week, draw from 5 to 15 cents an hour salaries, work out promotional and advertising schemes, design or consider new products, etc. Once a year, they rotate their jobs so that each can have the actual experience of being a president, production manager, or salesman. This equips them with a better understanding of the next man's job and leaves them better fitted to determine what vocation they are best suited for in the outside business world.

Once a month they hold Board of Directors meetings, and once a year they call a meeting of the stockholders. Everything is carried out in true business fashion though on a miniature scale, yet many of these "companies" have been so successful that they have been able to pay bonuses to the members and dividends to the stockholders, still have enough surplus capital from which to buy new equipment and add new products to their line!

The average yearly business done by a "company" is only about $100-$125 yet the fact that they are ahead rather than in the red at the end of the year, is a lot more than many big businesses can boast!

Take the outstanding achievement of the "Wood the Metal Arts Co.," sponsored by the Boys' Club of New York. In searching for working quarters to operate in, the boys became burdened with a $10 a month vacant store. Their leaders warned them against taking on such a high rental, predicted inevitable bankruptcy, and implored them to find something more reasonable. But they were determined and finally rented the place. They set up and made samples of costume jewelry, brooches, and pins, which they gave to their girl friends to wear to school and social functions and show them off to other friends. In no time, orders were pouring in from friends who had admired the novelties. The girls were given commissions as business kept picking up. One dollar's investment launched a hundred advertising postcards through the mails. Advertising stickers were posted around the neighborhood. Junior salesmen canvassed from door to door. The business grew, and in the short space of only six months, the Wood and Metal Arts Co. has grossed almost $600

[*Continued on page 175*]

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Precision Scope Mount For Your Rifle

[*Continued from page* 172]

steel, about 2½" in length, its main body 3/16" thick, and its upper edge forming a male dovetail to fit the female dovetail in the removable base. This male dovetail should be offset to right or left as may be required to bring it to position on whatever receiver it must fit, so as to permit bare clearance for pushing the removable base on and off; and it should be machined (either on mill or shaper) a few thousandths oversize to permit final file fitting to a very close, smooth fit in the female dovetail. A 7" die-sinker's needle file is just right for this fitting. Start the two parts together, tapping lightly; remove, file carefully where binds occur as shown by bright or abraded spots, and continue until the two parts can just be pushed smoothly together without tapping. A very fine, smooth "Barrett" file is excellent for the final fitting, and do not attempt to polish this dovetail, or it will make the fit too loose. A very slight taper is permissible, to allow the two parts to tighten up just as the final position is reached.

The notch Figure 4, should be carefully filed in with a small rattail file, after the dovetails are fitted together. Coat top of male dovetail with Prussian blue, turn lever to forward position (permitting flat portion of screw to clear top of side plate), and push the removable base into place; Now start to turn lever back, then slide the base back and off the side plate and commence filing at the mark made in the Prussian blue. Continue spotting and filing, until the lever will turn about ¾ of the way to its rearward position—*then stop filing.* Eventual wear will let it turn down to the stop pin in course of time.

Figure 6 shows the type of side plate used on a rifle having a cylindrical receiver, such as most bolt actions have. The shallow radius on inner surface of side plate should be a trifle shorter than the radius of the receiver, to assure a close fit without rock or wobble. This may be cut in with milling machine or shaper, or filed in with a half round file, using care to avoid slanting the radius cut, which would make the plate set on an angle. So far as possible, the top edge of side plate should be exactly parallel with the axis of the rifle's bore, otherwise, excessive adjustment of the scope reticule would be necessary. Dovetail portion of sideplate may be offset to right or left as necessary, and bottom edge may be straight or curved, as preferred. On bolt actions this side plate is usually let down into the wood of the stock, for which purpose the straight bottom line is preferable.

On .22 caliber rifles of streamlined design, and on some bolt action rifles as well, it is possible to set the mount in such a manner that the scope may be placed in position by pushing forward from the rear; but on some bolt actions having projections (such as the bolt release on the Mauser and Enfield) it is necessary to place scope from a forward position, sliding the removable base rearward onto the side plate. This is undesirable as (theoretically) the recoil of the rifle tends to kick the gun and sideplate backward out of the removable base; but with a properly fitted lever screw, well hardened against wear, there is, in actual practice, absolutely no tendency for the scope mount to "shoot loose."

Three 10-32 screws (preferably made of drill rod, hardened and tempered) are suitable for attaching the side plate to the receiver. On high power rifles these should be augmented by two No. 0 taper pins, as shown in Figure 6. These may also be used on smallbore arms if desired, although the light recoil makes them not really necessary.

Having all parts made, finish-filed and polished, the mount should be assembled, with the scope in position, and with the bases of bands set in approximate position in their dovetails in the removable base. Set the rifle in a bench vise (with jaws padded to protect the gun) and, with all working parts stripped from inside the receiver, put the side plate in approximate position, and clamp it lightly with two small C-clamps. Swing the vise around until, when looking through the bore, it is seen to center a very small dot placed on the most distant wall in the shop—or upon some small landmark seen through the window—such as the ball on a flagpole a block or so away. Turn vise, and lower or elevate gun very carefully until this "aiming mark" is seen through exact center of bore. Make sure that the scope reticule is set for zero both vertically and horizontally, and note where intersection of crosshairs or top of reticule post is pointing. Loosen clamps slightly and shift mount on rifle until top of post (or horizontal crosshair) is directly on aiming mark; tighten clamps. Move the scope laterally as required by shifting band dovetail bases in their dovetails in the removable base. When both the scope reticule and center of barrel bore are accurately aligned on the aiming mark, use a thin, sharp scriber to mark the position of the three screw holes for attaching side plate in receiver. Also, insert the scriber into the clamping screw holes in barrel band bases, and scribe their location on the surface of the band dovetail slots in the removable base.

Remove this base from the side plate, and drill down through the screw holes in band clamps just the depth of drill point. The band clamp screws, pointed and hardened, are now turned into place, clamping the bands firmly onto the scope, while their points prevent the bands from being moved out of position in their dovetails.

Before drilling and tapping the screw holes in rifle receiver, make sure that their position will not interfere with any of the working parts.

This method of aligning the axis of a telescope with the axis of the rifle's bore, is known as "bore sighting," and is the most accurate method known.

[*Continued on page* 176]

Junior Achievement, Inc.

[*Continued from page 173*]

worth of business, paid bonuses to its members, and paid time and a half for overtime!

Another "company" that's making its mark in the business world is "The Business Misses" formed by a group of ten jobless stenographers, who conceived the idea of selling part-time secretarial and stenographic work to small shops, storekeepers, and individuals who couldn't afford to hire a girl full time. The Business Misses operate in Chicago and have built up such a reputation for efficiency that established firms are continually hiring members from their ranks. In fact, it's common for Junior Achievement members to be hired by big business firms which keep a close scrutiny on their activities and are quick to appreciate the value of their unique training.

Patriotism runs high among the youthful members, and since the war many of the "companies" have turned to manufacturing defense items to aid in the war effort. One company produces luminous bomb shelter signs, another specializes in splints, another is making arm bands for block wardens engaged in civilian defense. The members also serve as air raid wardens.

The Junior Achievement Movement has not lacked for sponsors. No sooner is the plan unfolded to communities and civic organizations than they are eager to take part and lend their support. Many home workshop owners with fully equipped shops permit the "companies" to use their workshops a few nights a week for a nominal rental fee. Since big business must pay rent and all other incidental business expenses, Junior Achievement, Inc., insists that its members should pay rent monthly and not accept free offers of space, a practice which would only defeat the purpose of the plan.

The interest shown in the Junior Achievement Movement by big industrial leaders is more than mere coincidence. They realize that the youth of today will inherit the America of tomorrow and they are seeing to it that the youngsters get a firm foundation in the American way of living and its system of free enterprise. With this foundation and the thorough understanding of business problems that goes with it, today's youngsters will have little time or inclination for destructive "isms" in the future.

The latest development in the movement made by Junior Achievement Headquarters, is the holding of National Conventions each year. Started last year and held in New York, the convention was a huge success. The next one to be held is slated for Chicago this October. Each "company" will send a delegate who will enter exhibits of his company's craft arts, blueprints and models of original designs, records of the company, scrapbooks of its promotional achievements, etc. They will compete for awards of outstanding excellence in business operation, the most original design, and for outstanding promotional work.

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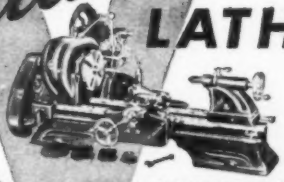

VITAL EQUIPMENT IN THE NATIONS' DRIVE FOR VICTORY

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The Secret Of Axis Strategy

[*Continued from page 77*]

Army and Navy at the time and died broken hearted. But his theory was eagerly seized by the Germans. It provided the one essential lacking to the final success of their plan. It is obvious today that Billy Mitchell was right. What is not so obvious is the fact that, in proving him right, the Axis has nearly succeeded in its plan of world domination!

Every step they have taken to date has been in conformity with this plan, starting from the German and Italian aid to Franco in Spain. This aid accomplished two things—it provided a training ground to prove out their theories of air and mechanized warfare and it put Franco under such obligations that the coastal areas of Spain would be available in the Axis plan of "marching around the oceans."

That march, after the preliminary occupations of Austria, Czecho-Slovakia and Poland to consolidate the "Heartland," started out with the seizure of Danzig, Denmark and Norway. The coasts of Holland, Belgium, and France followed in quick succession. Italy came into the Axis and her coastlines were added. The Adriatic and the Aegean were successively "marched around" by the seizure of Yugo-Slavia and Greece. The Black Sea was partially "marched around" by the domination of Rumania and Bulgaria.

The battle for Sevastopol was part of the plan—aimed at the total march around the Black Sea.

The battle of Libya and Egypt is part of the plan aimed at the total march around the Mediterranean Sea.

The plan requires the seizure of Suez, which is figured as one of the two "world hinges"—the other being Singapore—already fallen. The plan requires the making of the Mediterranean into an Axis lake. How far that is accomplished is evidenced by a glance at the map—which shows at this writing the coastline of that inland sea dominated by the Axis on both northern and southern shores—from Spain, to Turkey, with the southern shore almost completely dominated by Spain and Vichy-French Africa from the Strait of Gibralter to Egypt. Great Britain, at this writing, has only a toe hold on the shores of the Mediterranean and is in danger of losing this.

Suez is one of the "world hinges." Singapore the other, is already in the hands of the Axis. The Japanese are the absolutely essential "partners in crime" in this world encirclement plan.

Afflicted as they are with their own grandiose ideas of racial destiny, the Japs fell for the German plan, hook, line and sinker.

So far they have capably carried out their share. On the Asiatic side of the "World Island" they have-marched around the oceans from Sakhalin, through Manchuria, Korea, down along the coasts of China, through French Indo-China and around to Burma, incidentally picking up all the islands

[*Continued on page 178*]

Precision Scope Mount

[*Continued from page 174*]

All that is necessary now is a slight vertical or horizontal movement of the reticule by means of the adjusting screws on the scope, for accurate sighting at any range, or for any lot of ammunition.

If side plate is also to be anchored with taper pins, these may well be drilled and fitted in before drilling the screw holes.

FINISHING. All parts should be well buffed with Tripoli or emery cake to a fairly, but not extremely bright finish, then the removable base and side plate case hardened by one of the methods previously described in these pages. If a color hardening process is used, and the work comes out well mottled in rich dark colors, no further finish is necessary. Otherwise, it is well to re-buff to a smooth bright finish, and blue both parts, and the best way to blue case-hardened work is by boiling for 10 to 15 minutes in "Hough-to-Black" solution (a product of E. H. Houghton & Company, Chicago). The scope bands look best if blued to match the finish of the scope, and this same simple, inexpensive process is satisfactory for them.

Some prefer the side plate left bright, with plain finish, or damaskeened—a simple method for which has previously been described in this magazine. Attachment screws should be filister head, and heat blued in the hardening and tempering process if the plate is to be blued or color hardened. If plate is to be bright, or damaskeened, it is nicer to make the screws and taper pins "blind" by using countersunk screws with extra thick heads, turning them in hot so they will shrink in cooling, and then filing of screw heads and projecting ends of taper pins flush and smooth with surface of plate. When polished, or polished and damaskeened, the screws and pins are invisible. The smaller ends of pins projecting inside the receiver must of course be filed off flush and smooth before the action is reassembled.

When fitting a scope to a rifle so designed that it is impossible to look through the barrel from rear of receiver, bore-sighting may easily be accomplished by cutting a narrow strip from a piece of mirror, which is then inserted at an angle into the ejection port in right side of receiver. By looking into this mirror a clear view at the mark through the barrel may be had, and the aligning accomplished with no loss of accuracy, even though a bit more awkward!

ANSWERS TO QUESTIONS ON PAGE 143

1—The lamp, .55 ampere. Iron, 5 amps. Cleaner, 1.5 amps.
2—Secondary divided by primary turns, or 3 to 1 ratio.
3—A vacuum is weightless. Hence, the bulb increases in weight when air is admitted.
4—(A) No. 1 and No. 2 for the blue.
(B) Red and white.
5—Jointing a saw.

Craftsmen Attention!

HERE it is, you workshop fans! A big new edition of HOW TO BUILD IT No. 9, the famous manual that provides more entertainment and useful ideas for the home craftsman than any other book published. Crammed with plans and instructions for building more than 100 projects from wood, metal and plastics, plus handy kinks and hints on maintaining shop equipment, HOW TO BUILD IT, No. 9 is worth double its 50c price tag to any workshopper!

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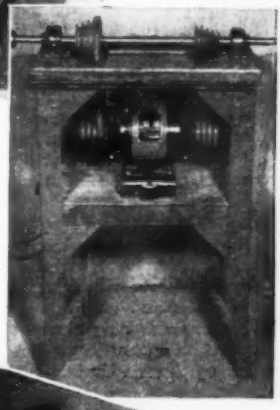

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HOW TO BUILD IT

The Secret Of Axis Strategy

[*Continued from page* 176]

en route, those marvellous stationary aircraft carriers intended to repel future attacks on their stolen mainland territories.

Today they stand on the borders of India in the South and on the borders of America in the North.

Today only some three thousand airline-miles separate the two Axis partners across the unstable areas of India, Afghanistan, Iran and the Causasus to the narrow strait of Kerch on the Crimea.

The Axis march around the oceans on the "World Island" of Europe, Asia and Africa is about 83% completed. The Axis dominates the shores of the North Sea, the Channel, the Bay of Biscay, Mediterranean, the Tyrrhenian, the Adriatic, the Ionian and the Aegean Seas. It controls the northwestern area of Africa, nearly one-third of that continent, and the most strategically important part from the viewpoint of the Western Hemisphere.

In the Pacific area the Axis dominates the Sea of Okhotsk (off Siberia), the Sea of Japan, the East China Sea, the South China Sea, the Celebes, Java and Banda Seas, the Bay of Bengal and part of the Indian Ocean. The Japanese march around the Asiatic oceans is nearly complete with the exception of the Arabian Sea and the Red Sea. It has now crossed the North Pacific, acquired advanced bases in the Aleutians and is ready to continue southward.

Where does Soviet Russia come in on this?

The geo-political plan of the Axis was not definite as to whether the Soviet was to be a voluntary partner in this plan or a subject nation, until Hitler suddenly attacked the Russian army. The picture is now clear—with the plan calling for domination of European Russia by Germany as far east as the Urals, while Japan is to be given domination of Asiatic Russia as far west as those mountains. China, under this plan, is to be a vassal state under Japan. Japan in addition to seizing air bases, is now hurrying to establish strong land lines along the Chinese coast, seizing the strategical railroads for the transportation of her troops, in order to be free from submarine and air attacks at sea.

Where do we come in on this—America and the Western Hemisphere?

We are slated to be the last victims, according to the published portions of the plan. Once the "World Island" of Europe, Asia and Africa, is sufficiently "marched around" to deny all bases for naval power and all island bases for land-based air power, to the United Nations, America is slated for simultaneous attack launched from both sides of the "World Island" in a gigantic pincers movement. One arm of this according to the plan, will extend from the Mediterranean, through Vichy-French Africa, to shoot from Dakar to Brazil, across the narrowest part of the Atlantic, and thence northward, aided by a million and a half Axis Fifth columnists in South America, to strike at the Panama Canal and eventually at the United States. This would force us to transport expeditionary forces to Latin America by sea, over distances greater in some areas than would be the transporting of an equal number of men to Europe. The intention, sound strategically, is to effect the utmost dispersion of American forces.

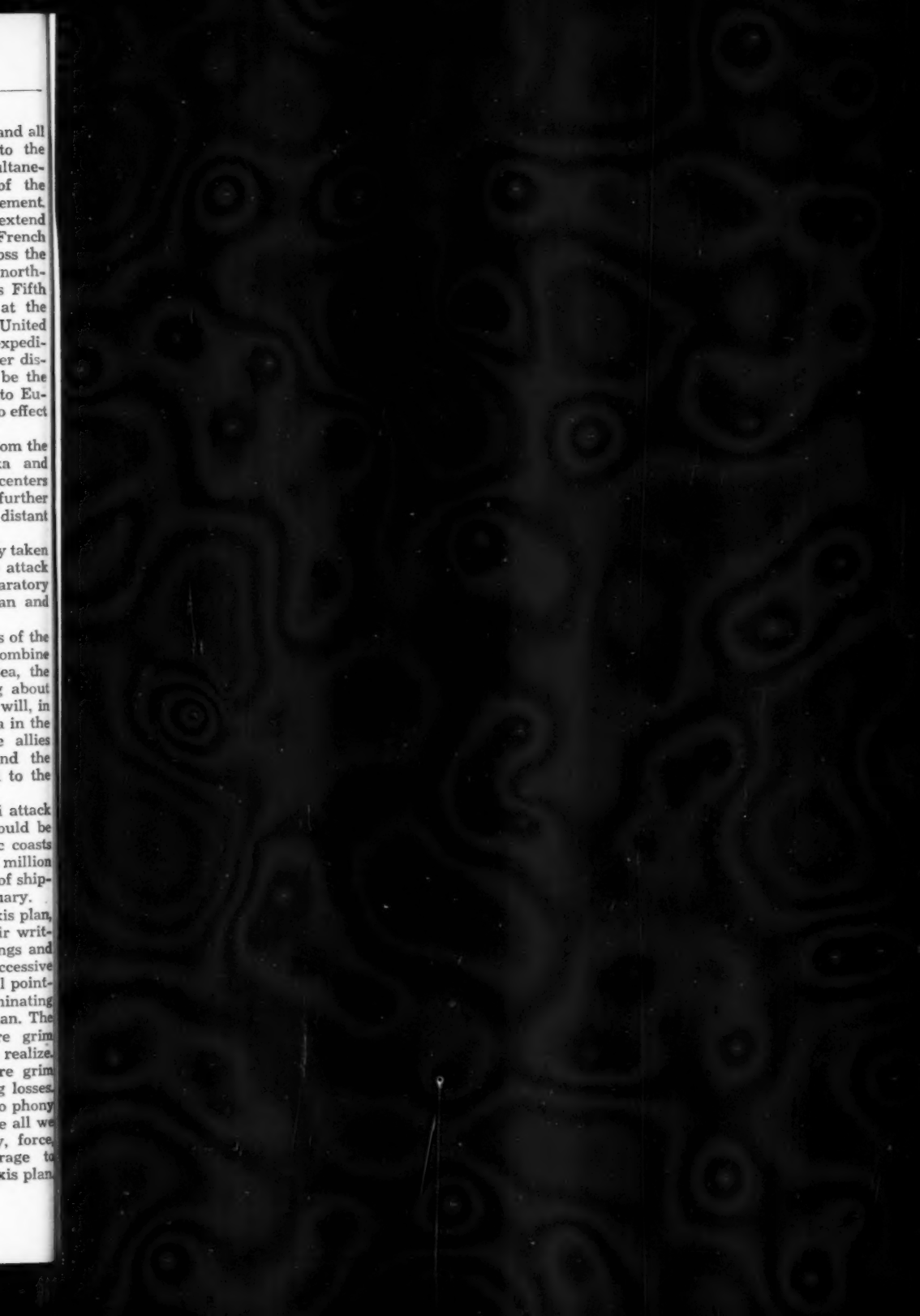
The other arm is slated to strike down from the North Pacific via the Aleutians, Alaska and Northern Canada to bomb our production centers out of the running and to force us to further dispersion of our forces at the two most distant points on our defense perimeter.

The attack upon the Aleutians has already taken place, with probably more to follow. The attack via Dakar and Brazil is now in the preparatory stages on the shores of the Mediterranean and the Black Seas.

With the fall of Sevastopol, the two arms of the Nazis pincers are slated to seize Suez, combine with their Japanese allies in the Red Sea, the Persian Gulf and complete the iron ring about Europe and Asia. This done the Japanese will, in all probability, attack Siberia and America in the North simultaneously, to separate those allies while the Nazis turn toward Dakar and the narrow crossing of the Atlantic to Brazil to the South.

That the preparatory stages of the Nazi attack on America are already taking place should be evident, with the sinking off our Atlantic coasts of a possible million and a half tons of shipping since January.

This is the Axis plan, based upon their writings and boastings and upon their successive steps to date, all pointing to the culminating steps in that plan. The picture is more grim than most of us realize. It is made more grim by our shipping losses.

This war is no phony war. It will take all we have of energy, force, skill and courage to frustrate the Axis plan.

"No, no, stupid! Just have him raise one leg at a time!"